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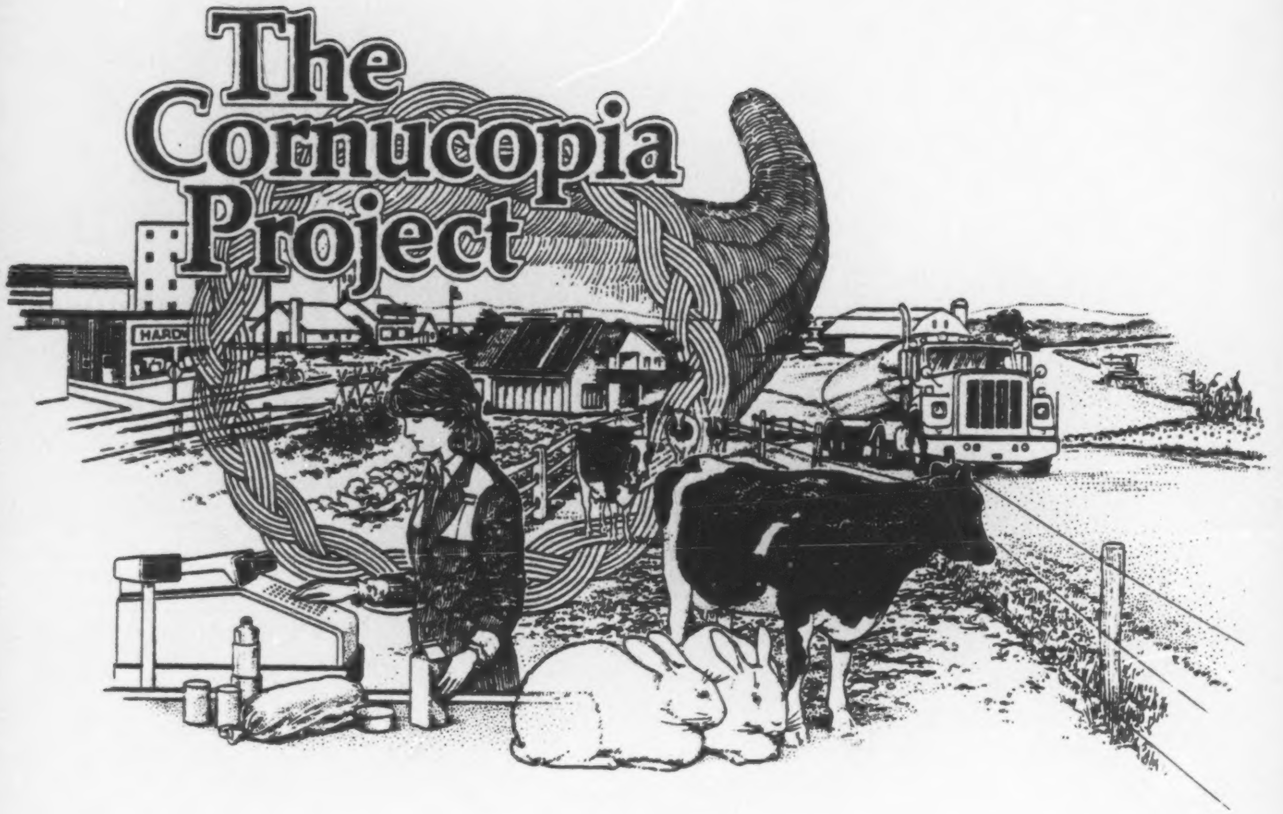
The Cornucopia Project
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THE ARIZONA FOOD SYSTEM: RUNNING ON EMPTY?

A Study of the Food System of Arizona by
BRAD HILL

with

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1982

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INTRODUCTION

-In California, agricultural officials desperately try to contain the Mediterranean Fruit Fly infestation, before the insects' larvae totally ruin dozens of different fruit and vegetable crops grown commercially in that state. As aerial sprayings are expanded to cover increasingly wider areas, growers in other states express concern about "Medfly" contamination of their crops, and call for embargoes against California produce.

-In Florida, a single night's freeze destroys a major portion of the state's citrus crop and many of the vegetables it grows for the winter market. The loss is reflected almost immediately throughout the United States by a jump in the price of orange juice concentrate and a shortage of some fresh vegetables.

-In Mexico, truck drivers stage a nationwide strike during early January, threatening to disrupt the flow of winter vegetables to the United States. A negotiated settlement ends the strike after one week.

-In Geneva, Switzerland, OPEC nations meet and agree to establish a new, unified oil price, which analysts predict will result in another worldwide increase in prices for petroleum products.

Each of these recent news events occurred far outside the boundaries of Arizona, yet each event had the potential to affect the cost and availability of food within our state. Each incident offered an example of the Arizona food system's dependence on political, economic, and environmental factors in other parts of the United States, and even in other parts of the world. Such dependence means vulnerability, because the welfare of Arizona's food system is determined by distant people and events, over which Arizonans have little control.

Any one of a number of possible crises--natural or human-made--could have disastrous consequences for Arizona consumers. A natural calamity cutting off food shipments from California (this almost happened during the 1981 Medfly infestation) would make many types of fresh produce unavailable or unaffordable in Arizona supermarkets. California supplies 41 percent of the fresh fruits and vegetables consumed in the United States, and as an immediate neighbor of the Golden State, it is a pretty safe bet that Arizona imports even larger quantities of California produce.

Mexico is another major source of fresh fruits and vegetables for Arizona and the U.S., especially during winter months. In February of 1980 alone, over 280 million pounds of Mexican-grown produce came over the border through Nogales.[1] A prolonged strike by Mexican truck drivers, an international quarantine on Mexican produce following crop disease problems, a serious drought, or a change in potential relations between the U.S. and Mexico could shut off another important source of Arizona's food.

A nationwide truck drivers strike in the U.S. would be even more disastrous to our food supply. Ninety-nine percent of all livestock, 88 percent of all fresh produce, and 80 percent of all meats, dairy products and bakery goods in this country are moved by truck.[2] A sudden halting of truck transportation would devastate Arizona in two ways: imports of food, fuel, and other essential goods would be cut off, while the state's economy would lose tremendous amounts of income because of its inability to export surplus cash crops.

An oil embargo or a sudden, steep price increase by the OPEC nations could also endanger our supply of food. Petroleum availability and cost is important because of its effect on the food transportation system, and because Arizona's agriculture is dependent on energy-intensive irrigation, chemical fertilizers, pesticides, and farm machinery. Since crop production in Arizona consumes five times as much energy per acre as does the average U.S. farm, many growers in the state might not be able to cope with another oil embargo or a round of major price increases.[3]

Even without any of these hypothetical crises, Arizona's farmers are in plenty of trouble. Many are badly in debt; in 1978, total outstanding farm mortgage loans amounted to over $484 million, an average of over $71,000 for each farm in the state.[4] Arizona's urban population explosion threatens to gobble up much of their best cropland, and dwindling water resources combined with increased demand for water by cities and industry may push many growers out of business. To top it all off, the state government often seems to have little interest in dealing with agricultural and food-related problems; at present, Arizona does not even have a Department of Agriculture.

ARIZONA'S FOOD SYSTEM TODAY--THE DISTURBING FACTS

Given the considerable potential for severe difficulties which could cut off much of the food that Arizona imports, or make the food too expensive for most Arizonans to buy, it is important that Arizonans take a close look at their food system. We need to examine how our food system currently functions, and how it *could* function to better meet the needs of Arizona consumers. Such scrutiny reveals some very disturbing facts:

-About 67 percent of all food consumed in Arizona is imported--from places like California, Mexico, and even Florida.[5] Having a food import rate of "only" 67 percent may sound good, compared to the Northeastern states, which import 80 percent or more of their food, but it still leaves Arizonans dangerously dependent upon distant, possibly unreliable food sources. This dependence adds too much to consumers' grocery bills and is unnecessary in a state with vast areas of arable lands, a wide variety of microclimes and many regions that enjoy nearly year-round growing seasons.

-Arizona consumers spend about $1.82 billion annually for imported foods; transportation of food imports alone cost almost $96 million.[6]

-Farming operations in Arizona are characterized by an extraordinarily heavy use of water, pesticides, and chemical fertilizers. Pesticides and chemical fertilizers are largely made from petroleum products and other imported materials. With the arrival of the Central Arizona Project (CAP), Arizona farmers will also be dependent on water imported from outside the state.

-The small family farm has become almost invisible in the economy of Arizona. Agriculture in the state is now dominated by huge, incorporated "agribusinesses." In 1981, Arizona had the largest average farm size in the country--5,465 acres (the U.S. average was 430 acres).[7] Although the total amount of farmland in the state has changed little over the past few decades, average farm size has increased rapidly while the total number of farms in Arizona has dropped, from 18,468 in 1940 to 7,100 in 1981—a decrease of 62 percent.[8]

On the positive side, it should be pointed out that Arizona's agricultural system does have great productive capabilities. Depending on the year, agriculture is Arizona's second, third, or fourth largest source of cash receipts.[9] In 1979, these cash receipts from all crop and livestock marketings totaled over $1.7 billion.[10] In 1980, Arizona ranked second among all states in production of durum wheat, lettuce, grapes and lemons, third in production of tangerines and cotton, fourth in oranges and grapefruit, and fifth in fresh market vegetables.[11]

In many ways, Arizona's climate is ideal for high-yield crop production. Southern Arizona, where most of the state's cropland is located, is one of the sunniest areas in the U.S., receiving 85-90 percent of all possible sunshine during a given year.[12] Many growers in Arizona enjoy over 240 frost-free days per year, and some areas such as Yuma may go an entire year without a single killing freeze.[13] While Arizona's soils are relatively low in nitrogen and organic matter, soil erosion--a serious problem for most American farmers--is very low in most parts of the state, probably due to Arizona's arid climate. In 1977, Arizona's estimated annual average sheet and rill erosion rate was 0.36 tons per acre--far below the national average rate of 4.66 tons per acre.[14]

Given these favorable conditions, along with almost unlimited access to inexpensive irrigation water, Arizona's farmers have been able to achieve remarkably high yields for some crops. Arizona cotton and alfalfa yields are about twice the national average, and durum wheat yields have been as much as two and a half times the national average.[15]

On the other hand, the advantages of long growing seasons, lots of sunshine, and low erosion rates may ultimately be negated by Arizona agriculture's biggest natural disadvantage--scarcity of water. Most of Arizona averages less than 12 inches of precipitation annually; the Yuma farming areas get less than three inches.[16] Typically, a large part of Arizona's precipitation comes during late summer, when temperatures and evaporation rates are highest. In the deserts of the Southwest, less than three percent of all rainfall ever gets to run off the land; most of the remaining 97 percent is lost to evaporation.[17]

Because of the arid environment, virtually all cropland in Arizona is irrigated. For years, this situation was taken for granted; farmers basically regarded water as an "unlimited" resource. Federally funded water projects made water almost dirt-cheap, and nobody thought very much about water conservation. However, the 1960's and 1970's saw a population explosion in Arizona's cities and the beginning of concern over how the state's water supplies could meet the needs of so many new residents and industries, along with an ever-thirstier agricultural system.

In the 1970's, Arizonans were using approximately 2.3 million acre-feet of surface water, and 2.5 million acre-feet of groundwater each year.[18] While surface water might be considered a "renewable" resource, groundwater reserves in the state are only replenished at the rate of about 300,000 acre-feet per year. This means that groundwater reserves were being depleted at an annual rate of 2.2 million acre-feet.[19]

The results of groundwater depletion are dramatically visible in many parts of Arizona. In Tucson, groundwater tables are dropping by an average of 1.3 feet per year, in Phoenix the rate is 2.3 feet. The water level of a well in the Salt Valley fell 55 feet in a five year period during the 1970's, and another well near Sells dropped 42 feet during the same period. Subterranean vacuums, produced by groundwater pumping, sometimes cause the earth's surface to collapse and crack. One such crack, miles in length, broke up highways and railroad tracks between Tucson and Phoenix.[20]

The problem of water resources is perhaps the most emotionally-charged political issue in the American Southwest. It has led to bitter confrontations between state and local governments, between the United States and Mexico, and among farmers, industries, mines, and Indian reservations. Mexican farmers have complained that Arizonan and Californian irrigation leaves Colorado River water too salty for use south of the border. A dispute between Arizona and California over water rights became the longest legal battle in the history of the U.S. Supreme Court. At one point, the Arizona government actually declared martial law and called up the National Guard to protect its water claims from California "theft".[21]

Today, Arizona has placed its hopes for salvation from drought in the Central Arizona Project (CAP), which is supposed to bring Colorado River water into the heart of the state, to be used by the residents of Phoenix and Tucson, various Indian reservations, and the farms and industries in central and southern Arizona. By mid 1981, CAP was still only one-third completed, and expected to cost $2.2 billion.[22] At times, various political squabbles have threatened to cancel all, or parts of, the project. Even if CAP survives all of these problems intact, its southern end will not reach Tucson until at least 1989, by which time that city may have suffered several years of serious water shortages.[23]

Even the most optimistic forecasts predict that CAP will only bring an extra 1.5 million acre-feet of water to Arizona in 1990, and that the annual total will actually decline to 1 million acre-feet by 2025, as other states along the Colorado River begin to claim their shares of its water.[24] Arizona will receive even less water if proposed shale oil plants go into operation in the Rocky Mountains and take large amounts of water from the upper reaches of the Colorado.[25]

Moreover, the 1968 Congressional Act which authorized the federal loan for CAP was passed with the condition that Arizonans must reduce their consumption of groundwater by an amount equivalent to volume of surface water they received from CAP.[26] The Arizona State Legislature dodged this problem for some 12 years, until, under heavy pressure from the Federal Government, it passed the Groundwater Act of 1980. Basically, this law mandated that the state must stop its overpumping of groundwater—by the year 2025.[27]

The difficulty in achieving this goal has been increased by Arizona's rapid population growth. With a 54 percent increase in population between 1970 and 1980, Arizona is the second fastest growing state in the country.[27a]

By the turn of the century, Arizona's population (2.7 million in 1980) is expected to reach 6 million. This means that agriculture, which currently uses 88 percent of all water consumed in the state, will face stiff demands for water from residential and industrial users in the cities.[28] These rival groups will probably get the lion's share of the water that CAP brings, while farmers will have to settle for whatever water is left over, if there is any left over at all. In Pima County, for instance, nearly 40,000 acres of cropland will only be allocated 30,000 acre-feet of CAP water annually. Droughts or higher than expected use of Colorado River water upstream from Pima County may mean even less water will be available for local agriculture. At the same time, provisions in the Groundwater Act of 1980 prohibiting overpumping will eventually prevent Pima County from drawing on more than 75,000 to 100,000 acre-feet of groundwater in a given year, all of which could go to the city of Tucson.[29]

For years, American drivers were used to cheap gasoline prices, only to be hit with the shocks of OPEC, beginning in the 1970's. For years, farmers in the American West have enjoyed artificially cheap irrigation, thanks to Federal Government subsidies. Consequently, there has been little incentive to conserve this resource. In recent years, however, farmers' bills for water and the energy needed to pump that water have increased rapidly. By 1979, irrigation accounted for 40 percent of variable production costs in growing cotton, 58 percent for growing wheat, and 65 percent for growing alfalfa.[30] As groundwater tables fall, pumping becomes more difficult and more expensive. New sources of surface water, like CAP, must be transported from more remote regions, and often must be pumped uphill. Still, without Federal Government subsidies, irrigation water would be prohibitively expensive. CAP water, for instance, is expected to cost Arizona farmers $52 per acre-foot; but the true cost of the project (including dams and canals) has been placed at $160 per acre-foot.[31]

With skyrocketing expenses, one might expect that by now, Arizona farmers would be making an all-out effort to curb their use of water as much as possible. On the contrary, agricultural water-use figures increased steadily throughout the 1970's.[32] Part of this may be because of the continued federal water subsidies, but part of it may also be because few farmers are willing to make the very expensive initial investments needed to install water-saving equipment, even though it can save them money in the long run. Drip irrigation, for instance, can cost as much as $1,000 per acre to install.

At the same time, cotton and alfalfa--the most water-thirsty of the major crops grown in Arizona--are also the two most widely grown crops. While acreage devoted to these two crops has increased, acreage for less water demanding crops, such as vegetables, has declined.

Finally government tax structures and policies for allocating water from federally sponsored water projects often discourage conservation. Growers who practice water conservation actually can be "punished" by having their water allotments cut during subsequent growing seasons.[33]

Water problems also play an important role in the loss of farmland to urbanization in Arizona. As the state's cities expand out into the countryside, farmers living in their vicinity come under pressure to sell their property. Developers want their land for new housing construction, non-farming neighbors may regard agricultural operations as an environmental nuisance, and city officials covet their water. Skyrocketing property taxes and irrigation costs provide the final incentives for many farmers to sell out.

Between 1965 and 1981, approximately 145,000 acres of irrigated cropland in Pima County went out of production, as Tucson's population and industries mushroomed.[34] The Groundwater Act of 1980 allowed cities to purchase and retire irrigated farmland, so that the water could be saved for other uses; Tucson has already bought 10,000 acres of farmland to obtain its water rights. While the total amount of cropland in Arizona has remained about the same for the past thirty years--around 1,2 million acres-- there has been a very significant change in where that cropland is located. Between 1967-1977, a yearly average of 32,000 acres of cropland (including 10,000 acres of prime cropland) was converted to other uses.[35] To make up the difference, new lands were opened for cultivation, often in remote desert areas, where soils tended to be more saline and less fertile and where ground and surface water were less readily available.

Arizona agriculture's extraordinarily high rate of energy consumption is directly linked to its tremendous demand for water. Overall, the U.S. food system is very inefficient in terms of energy expenditure. On average, it uses 6.4 units of commercial energy to produce each unit of food energy which reaches consumers.[36] Arizona's food system is even more wasteful. On Arizona farms, energy expenditures per acre of cropland are five times the national average.[37]

Except for the solar energy used by plants for photosynthesis, Arizona's food production system is powered almost entirely by fossil fuels. This situation is yet another point of vulnerability because fossil fuels are rapidly becoming scarcer and more expensive. Since many of these fuels are imported from other countries, international political or economic problems could cut off much of the supply. Nevertheless, energy use on Arizona farms, like water use, has continued to rise in recent years.[38]

Irrigation is a major factor behind Arizona's high rates of energy use; irrigation equipment accounts for about two-thirds of Arizona farmers' total energy bills.[39] As groundwater tables fall and surface water must be transported from greater distances, more energy is required. Other problems incurred by irrigation—soil and water salinization, geological subsidence, etc.—are corrected where possible but at great expense with mechanical and chemical technology that also require fossil-fuel based energy.

Arizona farmers' use of energy-expensive pesticides and chemical fertilizers also is high. In 1979, they applied almost 9 pounds of pesticides for each acre of cropland in the state, as compared with an national average of 2 pounds per acre. This amounts to 4 pounds of pesticides for every person in Arizona.[40] Though pesticide use increased rapidly in recent years (use of insecticides and herbicides more than doubled between 1966 and 1972[41]), there are indications that these pesticides are losing their effectiveness. For instance, a 1981 report in Progressive Agriculture in Arizona found that tobacco budworm resistance to methyl parathion increased tenfold between 1972 and 1978.[42]

At the same time, pesticide contamination of soil, air and water pose health hazards to wildlife, livestock and humans. A bulletin issued by the University of Arizona has cautioned farmers about growing wheat in soils previously used to grow cotton; residues from herbicides applied to the cotton crops may stunt the growth of wheat and other food grains.[43] In the Fall of 1980, many Arizona lemon orchard workers found out that they had been contaminated by DBCP, a pesticide banned by the EPA in 1979, but still present in drinking and washing water used in the orchard camps.[44]

Chemical fertilizers, like pesticides, are a major source of energy expenditure in agriculture and contribute to environmental pollution. In 1980, Arizona farmers used 541.4 pounds of fertilizer for each acre of cropland, as compared with a national average of 111 pounds per acre.[45] Chemical fertilizers have helped make some of the state's high crop yields possible, but they also may have had some undesirable side effects. Run-off from field fertilizers can contaminate bodies of water and create excessive algae growth, and fluoride emissions from phosphate manufacturing can damage plants and cause chronic fluorosis in cattle.[46]

Besides the environmental problems they may cause, chemical fertilizers are another source of vulnerability in Arizona's food system. Future supplies of phosphate, nitrogen, and potassium—the three most important chemical components of commercial fertilizers--are very uncertain at this time. Many of the mineral sources for these fertilizers are imported. For example, the United State's domestic supplies of phosphate may be exhausted by the turn of the century, at which time a small cartel of Mideastern nations could control world phosphate reserves to a much greater extent than OPEC now controls oil.[47] Current methods of nitrogen fertilizer production require large amounts of natural gas, which is becoming scarcer and more expensive. The U.S. now imports over three-fourths of its potash—the major component of potassium fertilizers—and by the year 2000, potash imports could exceed 90 percent.[48]

Supporters of the status quo in Arizona agriculture might argue that the intensive use of water, fossil fuels, pesticides, and fertilizers by Arizona farmers is necessitated by the region's harsh climatic conditions, and justified by the high yields returned on some of the bigger crops. However, there is good cause to question whether the crops that Arizona farmers produce, and the way in which these crops are produced, are really beneficial to Arizona's economy and food system. Because of the orientation of state agriculture to a few huge cash crops, Arizona is in the interesting position of being a major exporter of a few agricultural commodities, and a net importer of most others. Arizona farmers earn 90 percent of their income from only 16 crops.[49] The largest crop in terms of acreage—cotton—is not a food item. Eight of the other largest crops--alfalfa, winter wheat, hay, corn, barley, sorghum, safflower, and sugar beets—are used primarily as animal feeds. On the other hand, Arizona growers have been turning away from vegetable and fruit crops in recent years. Between 1965 and 1980, lettuce production was reduced from 36,260 acres to 8,300 acres, potatoes dropped from 11,000 acres to 4,400 acres, and cantaloupes from 17,450 acres to 6,500 acres.[50] During the same period, cotton acreage jumped from 345,000 acres to 632,000 acres.[51]

Cotton is the preferred crop in Arizona because cotton prices tend to remain high and stable. As the University of Arizona publication, Progressive Agriculture in Arizona, explains it:

> Cotton has a high value per acre, so it can pay for the high costs of irrigation and pest control necessary for production in Arizona....Vegetables are another high-value crop, but their prices fluctuate more rapidly and more widely than cotton prices. This higher risk factor demands that vegetable growers have the capital strength to withstand bad seasons.[52]

Most crops in Arizona today are grown with national and international markets in mind. It is very difficult for Arizona vegetable and fruit growers to compete with rival growers in California, Texas, or Mexico, when the latter can often produce the same goods in large quantities, at less expense. As a result, Arizona's fruit and vegetable production is generally oriented towards off-season production for out-of-state markets, to fill the seasonal gaps left by other vegetable producing areas. Often this means that produce is grown under less than ideal weather conditions and suffers high spoilage in the process of being shipped to distant markets.

In the short term, cotton may indeed be more profitable for Arizona farmers than fruit and vegetable crops, but ultimately, making cotton the state's primary crop could spell disaster for Arizona's economy and food system. Cotton's high prices are due to heavy exports; in 1981, over 90 percent of Arizona's cotton crop was shipped overseas.[53] A heavy economic reliance on exports, just like a heavy reliance on imports, leaves an area vulnerable. If countries that import U.S. cotton should decide to become more self-sufficient, foreign demand could drop sharply, and the cotton market would disappear.

In the meantime, cotton crops occupy over one-third of Arizona's irrigated cropland, and require a much greater input of water, fertilizer, pesticide, and energy than do most food crops. It takes about 12,548 billion BTU's of energy to produce an acre of cotton, as compared to an average of 1,400 billion BTU's for an acre of vegetables.[54] Water use for cotton in Arizona is about 41 inches per season, as opposed to 25 inches for barley, 24 inches for potatoes, 19½ inches for sweet corn and 8½ inches for lettuce.[55] Cotton receives almost half (47 percent) of the insecticides used in the United States;[56] the detrimental effect of cotton pesticides on other crops grown for food has been previously noted.

Cottonseed meal can be used as a feed for cattle, but even this "contribution" to Arizona's food system may ultimately do more harm than good. In the late 1970's, high levels of carcinogenic aflatoxins showed up in the meat and milk of Arizona cattle. The aflatoxins were traced back to cottonseed meal feed.[57]

WHAT DO THESE FACTS MEAN?

With its wide range of microclimes, Arizona could produce almost any type of fruit, vegetable, or grain now consumed in the state. Few states can boast the potential to grow both hot weather crops like citrus fruits, olives, figs, and dates, and cool-weather produce like apples, potatoes, and broccoli. Yet, Arizona is importing many foods which could be grown right here at home. Imports mean vulnerability--vulnerability to crises that could shut off food supplies or make our food prohibitively expensive. It has been estimated that the average U.S. city has only a two to three days' supply of food; in the case of a food "emergency," panic buying could empty grocery store shelves in a single day.[58] As cities like Phoenix and Tucson grow, surrounding truck farms disappear, and these cities become even more dependent on outside food sources.

Imports have other disadvantages besides increasing the danger of food shortages. They also make our food more expensive. The USDA has conservatively estimated that 5.3 percent of the American food bill goes to transportation costs.[59] In addition to this, consumers also must pay for government subsidies to the food transportation industry, and for food waste that occurs when food spoils in long distance shipping. Arizona's local economy is weakened when money is sent out of the state for food imports, because each dollar spent by an Arizona consumer will generate valuable local business.

A third disadvantage of imported food should be obvious to anyone whoever compared the tastes of a fresh-from-the-garden grown tomato with that of the "cellophane" tomatoes found in most grocery stores. Food shipped from distant places just doesn't taste as good as local produce. Moreover, long-distance food is less nutritious. Fruits and vegetables, for instance, are apt to lose much of their vitamin content through premature harvesting, overhandling and the longer period of time that it takes for the food to reach the consumer.

Even if a particular type of food is grown in sufficient quantities within the state to meet the demands of Arizona consumers, there is no guarantee that Arizona actually is self-sufficient in that food. Arizona has relatively few facilities for receiving, processing, packaging, and storing foods, so Arizona produce is often shipped out of the state for processing, and then, perhaps, shipped back into the state for retail sales. An example of this problem is the beef situation in Arizona. Arizona is one of the few states which has enough cattle to produce a surplus of beef, but the state actually is a net importer of beef because there are not enough slaughterhouses in Arizona to process the meat.[60] Orange juice is another case. Despite Arizona's huge orange crop, 70 percent of which is exported, almost all fresh, frozen or canned orange juice found on the shelves of Arizona grocery stores comes from Florida or California.

Arizona is a net exporter of many foods, such as milk, lettuce, cabbage, onions, citrus fruits, etc. In the short term, food exports can benefit the state's economy by bringing in cash income, creating jobs in the food production sector, and helping to pay for other goods that the state must import. However, there are serious dangers in gearing the state's agriculture towards a few cash crops. The export crops displace other food crops, which subsequently must be imported into the state. In the event of a transportation shutdown, Arizona would not be able to ship its surplus crops to market and also would be unable to obtain imported foods. By encouraging export agriculture, Arizona is promoting a national food system that wastes food, energy and money through long distance transportation. Commercial, large scale export agriculture also leads to lack of crop diversity, increasing the danger that the few crops grown may be wiped out by disease or insect infestations.

WHAT CAN WE DO?

The facts about Arizona's food system are alarming, but the situation is not hopeless. One of the main factors behind Arizona's various food problems is a lack of clear-cut, long term planning and goals. If such planning and goals were developed, there would be many things that Arizonans--farmers, consumers, business people, educators, researchers and government officials--could do to create a food system that would best serve their needs. Such a food system could be productive, dependable, sustainable, safe, efficient, and self-reliant.

A productive Arizona food system would give every person in the state access to adequate food--adequate in quantity, quality, and degree of choice. A dependable system would provide all Arizonans with a reliable food supply, free from economic, political or environmental disruption. A sustainable system would insure that cultural, economic, and environmental conditions of food production, processing, and distribution would permit the food system to be productive indefinitely--despite possible changes in climate, availability of resources, political upheavals, etc. Safe means the food system would not harm workers, consumers, or the environment. An efficient system would make the most economic use of energy, water, soil nutrients, and other resources.

The last term, self-reliant should not be confused with self-sufficient. We are not necessarily saying that Arizona should produce all of its own food. Even with Arizona's wide range of climates, there are some popular food items--bananas, coffee, tea, pineapples, cocoa--that cannot easily be grown here. Arizonans should try to produce enough of our food in sufficient variety so that we could 1) lower the cost and improve the quality of the food we consume, 2) be prepared for a sudden cutoff of food from outside the state, 3) strengthen our local economy by keeping more of the food business at home, and 4) diversify our agricultural production system, thereby making it more reliant in times of stress--both environmental and economic.

These are not unrealistic goals. Arizona already produces about half of its own food. Still, we can and should do much better than that. Arizona has the potential to produce virtually all of its own vegetables, fruits, grains, meat, and dairy products-if we decide that is what we want to do.

The biggest problem currently facing Arizona food production is the water question. If Arizona agriculture is to be sustainable, it must learn to use less water. Present water consumption rates in the state cannot continue indefinitely, even if CAP is successfully completed. Continued overdrafting of groundwater reserves would be ecologically disastrous, and an act of suicide for the state's farmers.

Among the fifty states, Arizona ranks number eight in its consumption of water. It ranks twenty-ninth in population. Obviously, Arizonans could do more to conserve. Some water savings could come from domestic users in the cities; anyone who has seen the lush lawns, golf courses, giant fountains and even artificial lakes in Phoenix or Tucson could testify to this. However, 88 percent of all water in the state goes to agriculture, so plainly, most of the conserving must come from the farmer.

FARMERS

What can farmers do to save water? To begin with, they should work towards developing crops that are better adapted to the Southwest Desert environment, rather than struggling to adapt the environment to temperate climate crops. Fortunately, there is a growing amount of research being conducted in this area, by scientists at the University of Arizona and by private individuals on Arizona farms. In the Sonoran Desert, workers at the Arizona Agricultural Experiment Station have identified nearly 400 wild species of plants used by desert Indians as food, plus at least 500 more once used for medicine, fiber or other purposes.[61] Many of these plants could be adapted to cultivation, using little or no irrigation. One such example is buffalo gourd, a prolific "weed" native to the Southwest Desert, which requires only 10-16 inches of water annually. Various parts of this plant can be made into a high protein flour, edible oils, food starches, or syrups for human consumption--or it can be used as an animal feed. Tepary beans, used by Arizona Indians as a wild and a cultivated food source, can reach maturity on as little as eight to ten inches of rainfall. In cooking, they can be used like pinto beans, to which they have a similar protein content. Even the tumbleweed-symbol of the dry, "dead" desert in many Western movies--has parts which can be eaten.

Instead of growing crops primarily for export, Arizona growers should devote more attention to producing a wider variety of crops that better meet local consumer demand, while also using less water. Cotton and alfalfa together occupy over half the cropland in Arizona. Each requires about twice as much water as the major grains and vegetables grown in the state, but neither is used directly as human food. It would be a wise step, in the long term, for Arizona growers to move away from these crops and devote more of their land to producing a diversity of fresh vegetables, fruits, grains, legumes, nuts, etc. Farmers and consumers could benefit by experimenting with food crops from other parts of the world that have arid climates like our own. Pearl millet, for instance, might be a good crop for the Southwest deserts. A highly nutritious grain, millet is regarded only as "birdseed" by most Americans, but is a dietary staple for people in many of the drier regions of Asia and Africa.

By reducing their consumption of beef and other meats, Arizonans could save money and help conserve water. It takes about 2,800 gallons of water to produce one eight ounce steak, as compared to 408 gallons for 8 ounces of chicken meat and 12 gallons for 8 ounces of potatoes.[62]

When irrigation is needed, farmers should strive to implement methods that use minimal amounts of water. A 1976 GAO study estimated that 50 percent of all irrigation water in the U.S. was wasted.[63] For years, the "open ditch" method of agricultural irrigation predominated in the U.S. West. It was simple and relatively cheap (because the Federal Government subsidized the water), but it used six times as much water as sprinkler systems and one hundred times as much water as drip irrigation.[64] The traditional high-pressure nozzles used in sprinkler irrigation lose 20 percent to 30 percent of their water to evaporation before it even hits the ground.[65] By shifting towards drip irrigation and low-pressure sprinkler nozzles, Arizona growers could save tremendous amounts of water. Such changes are, of course, expensive. The Arizona State Government could help by providing tax breaks and other financial incentives for farmers who install such equipment. On the other side of the coin, the Groundwater Act of 1980 should do a great deal to enforce water conservation among all users and end the overpumping of groundwater. The Act does have a couple of questionable aspects as far as Arizona's food system is concerned--the fact that the overpumping provision does not become completely effective until 2025, and the provision encouraging cities to buy out farmland for the water rights.

There are still other methods farmers can use to lessen their dependence on irrigated water. Leveling makes cropland as flat as possible, thus minimizing runoff loss. Land imprinting machines create small rills in the soil and crush existing vegetation into mulch, thus increasing the soil's water retention. Water catchment--a technique used centuries ago by Southwest Indians--involves the use of compacted soils, asphalt, plastic or other impermeable surfaces to trap water from rainfall and flash floods. The water is subsequently stored in reservoirs for future use. Properly treated effluent, from residential and industrial use, could also be used for irrigation.

Reductions in water used for irrigation would inevitably lead to farm energy savings. Further energy savings could be achieved by reduction in the use of chemical fertilizers, pesticides, and fossil-fuel burning farm machinery. Emphasizing biological control alternatives to pesticides could help alleviate such problems as increasing pest immunity and contamination of the environment as well as reducing consumption of petrochemicals needed to manufacture pesticides. Farmers could reduce dependence on chemical fertilizers by making use of on-farm fertilizer sources, such as nitrogen-fixing legumes, green manure crops, and animal manures. Organic wastes from municipalities might also be used. By practicing crop rotation, crop diversification, and periodically allowing fields to stand fallow, farmers could reduce need for both fertilizers and pesticides. The state of Arizona and local governments could encourage such trends by enacting strict laws regulating the use of potentially hazardous pesticides and fertilizers, and by sponsoring research in natural pest control and fertilizer production. Growing more food locally would also help protect Arizona consumers from exposure to hazardous pesticides. A large portion of Arizona's food imports now come from Mexico, where pesticide regulations are much more lenient and not as well enforced as they are in the United States.

Just as they could develop on-farm sources of fertilizer, Arizona farmers could do a great deal to develop on-farm sources of energy. Certainly, if there is any place in the U.S. with a potential for solar-powered agricultural technology it is the sunny state of Arizona. Numerous oil crops native to the Southwest deserts--such as guayule, jojoba, or gopher plant--could be viable alternatives to many petroleum-based products. Greenhouses could be used to extend growing seasons, especially in cooler areas of the state.

By establishing more in-state industries to collect, process, package, and sell locally grown foods, Arizonans would save the energy and money now wasted sending foods out of the state for processing, then back into the state for retail sales. If this action were taken in regard to the beef industry, for instance, Arizona could become self-sufficient in beef, without increasing the number of cattle raised in the state.

CONSUMERS

Consumers can encourage more local production and processing of food by educating themselves as to where food comes from and what is done to it. They can then express their desire for more fresh, locally produced produce to food retailers and patronize farmers markets, where food can be purchased directly from the growers. Consumers who live in urban areas can join food co-ops or buying clubs which contract with Arizona farmers. These organizations not only promote local food production, they also can save the consumer money and improve food quality by buying in bulk, eliminating "middlemen" profits, and cutting down on unnecessary processing and packaging.

Going a step further, Arizona consumers could grow more of their own fresh produce. Even a small backyard garden in a city can make a significant contribution to a family's annual food supply, especially if surplus produce is preserved and stored for "off-season" months. Receiving more personal attention and care than the huge vegetable farms could ever hope for, family or neighborhood gardens could be much more efficient in their use of water, fertilizer and other resources. A survey by the State Department of Water Resources found that an average Tucson home with a lawn uses about 17,000 gallons of water per month during the summer to keep the lawn green. Arizona homeowners could put some of this water to a much more productive use by growing vegetables instead of grass.

STATE

The Arizona state government could encourage diversification of food production by providing technical assistance from extension agents and low interest, state guarantee loans to help farmers finance changes needed for starting new crops. A State Department of Agriculture, if one were created, along with the University of Arizona College of Agriculture, could study the feasibility of bringing "new" crops into commercial production in Arizona. Such "new" crops could include indigenous wild plants that could be converted into domestic food crops, and dryland crops from other arid regions.

To promote diversification of crops, the state should encourage more small-scale food production operations as alternatives to the gargantuan farms which presently dominate Arizona's agriculture. Encouragingly, Arizona's trend towards larger and larger farms seems to have reversed during the last few years. Between 1975 and 1981, the number of farms and ranches in the state actually increased from 6,300 to 7,100.[66] However, it should be kept in mind that the long-term trend in both Arizona and in the United States has been towards larger and fewer farms. The state government could encourage more small farms by providing tax incentives—such as not taxing the first $10,000 of income earned from food produced for local consumption. Guaranteed state loans to new farmers, with deferred or reduced payment until five years after start-up (such loans are now provided in Minnesota) could encourage new people to enter farming. The state could also make a special effort to provide technical and organizational assistance for new farmers.

A major problem for small producers in Arizona is finding a market. They often have problems transporting their produce to urban markets, and commercial food buyers often only want to buy in large quantities which small-scale growers can't produce. By forming producers' co-ops and self-help groups, small-scale farmers could increase their marketing potential. At the same time, farmers markets and food-buying co-ops would encourage consumers to buy more food produced by small, local operations. Farmers could also deal more directly with consumers by establishing more roadside stands and "pick-your-own" operations. State and local governments could help promote more farmers markets (including wholesale markets to supply retailers), give preference to Arizona-grown food when purchasing food for use in government institutions, promote and provide assistance for food processing operations that buy local products, and provide assistance to small-scale growers through a statewide marketing clearinghouse. Arizona could also learn from those states which promote local foods through advertising campaigns and use a logo to identify foods produced within the state.

Arizona also must take action to prevent the loss of good farmland to urban expansion and the subsequent movement of farms to areas where soil quality and water availability are poorer. To this end Arizona might wish to emulate California, which undertook a computerized mapping and inventory of all its farmland, in order to safeguard such land from development.[67] With information from this inventory, Arizona could identify the current status and potential of all of its farmlands, as well as assess the availability of other lands for new agricultural operations.

Arizonans might also look to New York State, which has established agricultural districts, to protect farmland from urban expansion. In Suffolk County, New York, farmers who sell their development rights are paid the difference between the value of their land for development and the land's value for agriculture. This policy helped keep land in crops, and was so popular that Suffolk County residents actually voted to raise their taxes to finance it.[68]

State tax policies could also serve to discourage conversion of farmland to nonagricultural uses. Some existing Arizona tax laws already serve this purpose; for instance, farms are taxed at current use value, rather than potential market value. This law is especially important to farmers living in areas of urban development where property value and property taxes are skyrocketing.

Additional taxes that Arizona should consider include stiff levies imposed on profits made by developing prime agricultural land, and a farm capital gains tax that would discourage putting prime cropland on the speculative market.

Borrowing an idea from France, Arizona might wish to consider a policy that would allow the state "first refusal" rights to any farmland up for sale. In this system, farmers planning to sell their land are legally required to notify a state-chartered, non-profit corporation of their intention to sell. The corporation has a right to buy the farmland within thirty days. If it does so, it will resell the land only to farmers who agree to keep using it for commercial farming.[69]

The suggestions listed above combine a strong organizational and self-help effort among Arizona's farmers, consumers, and businesses with technical, informational, and financial help from the state government. However, if this assistance from the state is to be forthcoming, there must be one important, long overdue change in Arizona's state government--the creation of a State Department of Agriculture. Better yet would be the creation of a State Department of Food and Agriculture.

In 1978, Arizona consumers were frightened by reports of high levels of carcinogenic aflatoxins found in the milk of Arizona cows. One of the most upsetting aspects of this crisis was the fact that none of the state's twenty-plus agriculture-related agencies could be fully held accountable for the problem. As a result, the state government was not able to react to the situation quickly. This prompted Governor Bruce Babbit to call for the creation of a single State Agriculture Department that would consolidate all the little agencies and effectively regulate overall food production.[70] Babbit's proposal died in the state legislature.[71]

Babbit's primary concern in advocating a Department of Agriculture appears to have been insuring food safety and quality. However, such a department could serve many other functions that would benefit all Arizonans. It could help develop state food strategies and coordinate these strategies with farmers, consumers, the food industry, and the federal and local governments. It could assist farmers with research and development, diversifying production, and conserving water and other resources. It could encourage the start of new farms and promote consumption of Arizona-produced food. It could serve as a stronger voice in government for the interests of farmers (especially small farmers) trying to protect their land and resources from development. It could also help develop a state emergency food plan, to deal with contingencies that might disrupt Arizona's food supplies from outside areas or problems threatening Arizona's own food production, such as crop failures. Achieving greater local self-reliance in food production would be one of the most important components of this plan. Other steps might include establishing state emergency food storage facilities, encouraging home and community storage of basic foodstuffs, and setting up a statewide network of communication and coordination centers through existing civil defense organizations, to deal with food emergencies.

Above all, an Arizona Department of Agriculture and Food Policy could develop badly needed long-term planning for a safe, efficient, sustainable, self-reliant state food system that would best serve the needs of all Arizonans--now, and in the future.

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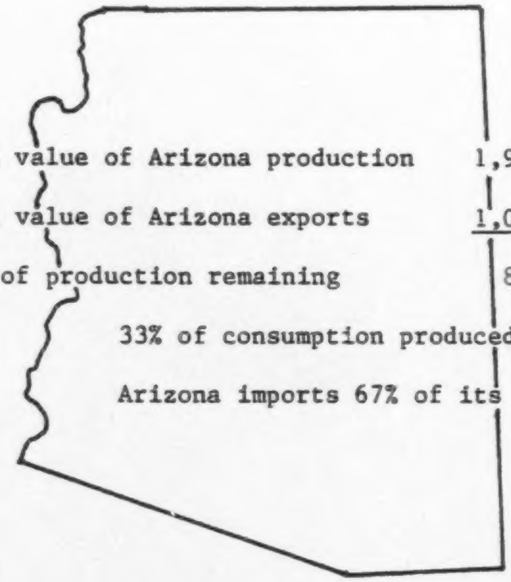
APPENDIX

Arizona's agricultural potential is impressive. In 1980, Arizona ranked second of all states in production of durum wheat, lettuce, grapes, and lemons. It ranked third in production of tangerines, fourth in grapefruit, and fifth in fresh market vegetables. Southern Arizona receives 85 to 90 percent of all possible sunshine in a given year, and many farmers enjoy 240 frost free days of growing. Despite these successes, 67 percent of the food Arizonians eat is imported. In many cases, Arizona imports the same foods it exports. Erosion and increasing demands on limited water resources threaten Arizona's future food production, as does loss of agricultural land due to development.

To begin to recognize and solve the weaknesses in Arizona's food system, a State Department of Food and Agriculture needs to be established. Further research should be done on food crops suitable for dryland farming, as well as energy and water efficient irrigation systems. Crops grown for export need to be carefully balanced with food crop production for in-state consumption. A network of markets and buyers is needed to assure that farmers receive fair and consistant prices for their food crops.



Retail value of Arizona production	1,980,149,900
Retail value of Arizona exports	1,085,310,940
Value of production remaining	894,838,960

33% of consumption produced in Arizona

Arizona imports 67% of its food.

ARIZONA FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight[a] (1,000 lbs)[d]	Retail Value ($1,000)[b] (1981 dollars)	CONSUMPTION Retail Weight (1,000)[c]	Retail Value ($1,000)[b] (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres required to produce 100% of AZ Consumption
Meats									
Beef	160,272.8	378,243.8	216,342.0	510,567.12	26.0	132,323.32			2,836,717.0
Lamb/Mutton	87.16	260.61	3,533.0	10,563.67	97.5	10,203.06			1,177.7
Pork	38,441.65	52,280.64	175,524.0	238,780.64	78.1	186,487.67			192,080.0
Veal	155.52	1,178.35	4,349.0	33,008.91	96.4	31,830.56			k
Poultry									
Chicken	Insignificant[e]	Insignificant	139,970.0	104,977.5					59,987.1
Eggs	14,753.0[f]	8,296.96	97,300.0	54,715.72	84.8	46,418.76			7,230.6
Turkey	Insignificant	Insignificant	27,400.0	27,340.64					19,116.0
Fish	Insignificant	Insignificant	36,147.68	84,585.42	100.0			84,585.42	
Dairy									
Cheese	NC[g]	NC	60,336.6	162,305.45					
Condensed and Evaporated Milk	NC	NC	20,655.8	30,983.7					
Dry Milk	NC	NC	9,240.74	19,347.80					
Fluid Milk and Cream	1,060,000.0	285,405.0	627,827.04	169,042.43			40.8	116,362.57	80,252.0[l]
Ice Cream	25,444.0	98,824.50	47,562.65	184,733.35	46.5	85,908.85			

(Contiqued on next page)

ARIZONA FOOD IMPORTS

	PRODUCTION		CONSUMPTION						
COMMODITY	Retail Weight (1,000 lbs)	Retail Value ($1,000) (1981 dollars)	Retail Weight (1,000)	Retail Value ($1,000) (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Area Required to produce 100% of AZ Consumption
Fresh Vegetables									
Broccoli	4,400.0	4,356.0	38,050.01	3,766.96			12.6	589.04	559.6
Cabbage	95,300.5	28,685.45	23,645.43	7,117.28			75.2	21,508.17	1,001.9
Carrots	27,500.0	8,470.0	16,578.98	5,106.33			39.7	3,363.67	1,201.4
Cauliflower	20,500.0	26,445.0	3,533.22	4,557.85			82.8	21,896.46	430.9
Celery	NC	NC	20,383.00	7,786.69					422.9
Cucumbers	NC	NC	11,686.82	4,569.85					1,082.1
Dried Peas	NC	NC	434.9	152.22					315.14
Dried Edible Beans	NC	NC	17,384.3	8,871.11					11,938.4
Garlic	NC	NC	2,989.65	2,965.98					230.0
Lettuce	829,900.0	406,651.0	70,936.0	34,758.79			91.5	371,892.2	3,138.8
Onions	62,300.0	23,300.2	32,070.81	11,994.48				11,305.72	720.7
Peas	NC	NC	1,087.15	3,239.71					310.6
Peppers	NC	NC	9,512.53	8,466.15					980.6
Potatoes	127,600.0	34,834.0	143,503.0	39,176.41	11.1	4,348.58			4,948.3
Rutabaga/Turnip	44,611.0	2,631.99	NC	NC					1,119.1
Snap Beans	NC	NC	3,805.01	2,347.69					
Spinach	30,008.93	14,704.37	1,358.93	655.88			95.5	14,038.49	186.15
Sweet Corn	NC	NC	20,112.21	6,033.66					2,545.8
Sweet Potatoes	NC	NC	11,958.61	5,859.72					1,172.4
Squash (pumpkin)	5,090.72	3,003.52	1,630.72	926.12				2,007.4	NC
Tomatoes	11,771.68	7,604.50	34,516.9	27,297.92	72.1	19,692.92			2,054.6
Frozen Vegetables									
Asparagus			217.43	269.70					108.7
Broccoli			3,723.48	4,654.35					557.1
Brussels Sprouts			788.18	827.59					88.4
Carrots			2,962.48	2,636.61					357.6
Cauliflower			1,358.93	1,658.07					1,550.2

(Continued on next page)

ARIZONA FOOD IMPORTS

COMMODITY	PRODUCTION		CONSUMPTION						
	Retail Weight (1,000 lbs)	Retail Value ($1,000) (1981 dollars)	Retail Weight (1,000 lbs)	Retail Value ($1,000) (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Area Required to produce 100% of AZ Consumption
Frozen Vegetables (cont.)									
Corn			2,799.4	2,435.48					425.2
Limas			1,386.11	1,441.55					589.9
Onions			2,038.34	1,977.19					55.0
Peas			4,729.09	3,641.40					1,468.7
Potatoes			44,193.37	31,975.69					3,765.8
Snap Beans			3,342.98	3,242.69					1,310.6
Spinach			1,984.04	1,488.03					271.8
Canned Vegetables									
Asparagus			8,153.36	3,424.51					414.5
Beets			2,717.87	1,549.0					113.9
Carrots			1,358.93	774.59					131.3
Lima Beans			1,087.15	837.11					434.8
Peas			8,697.17	6,522.88					2,061.0
Pickles			23,373.64	18,698.91					1,701.5
Sauerkraut			3,533.23	42,013.94					134.8
Snap Beans			16,307.2	9,621.25					3,414.9
Spinach			2,174.3	1,978.61					131.8
Squash/Pumpkin			1,630.72	1,027.35					NC
Sweet Potatoes			3,805.01	2,625.46					427.5
Tomatoes (Whole)			15,763.62	9,615.81					520.4
Catsup, Paste, etc.			39,409.06	23,645.44					4,253.0
Tomato Puree			2,714.29	1,326.32					524.6
Tomato Vegetable Juices			7,610.03	3,044.61					
Corn			14,948.26	7,324.65					1,525.3
Fresh Fruit									
Apples	NC	NC	47,019.08	29,669.04					3,616.8
Apricots	332.44	383.70	271.8	323.4			15.7	60.24	197.9

(Continued on next page)

ARIZONA FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight (1,000 lbs)	Retail Value ($1,000) (1981 dollars)	CONSUMPTION Retail Weight (1,000 lbs)	Retail Value ($1,000) (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Area Required to produce 100% of AZ Consumption
Bananas	None	None	58,162.33	20,124.17	100.0	20,124.17			NA
Cantaloupes	90,700.0	44,443.0	24,189.0	11,852.61			73.3	32,590.39	1,727.8
Grapefruit	192,000.0	85,056.0	20,655.78	9,150.51			89.2	75,905.49	908.0
Grapes	6,200.0	5,660.6	9,240.74	8,436.8	32.9	2,776.2			4,708.3
Honeydew Melon	24,000.0	11,760.0	NC	NC					
Lemons	231,800.0	195,639.2	5,435.73	4,587.76			97.7	191,051.44	475.1
Oranges	262,500.0	111,300.0	34,245.11	14,519.93			86.9	96,719.70	2,043.0
Peaches /Nectarines	26,659.88	13,703.18	19,568.64	10,058.28			26.6	3,644.9	653.3
Pears	NC	NC	6,794.67	4,008.86					989.2
Plums/Prunes	26,188.22	9,982.23	4,892.16	2,397.16			75.8	7,495.07	
Strawberries	NC	NC	5,435.73	5,464.72					1,168.5
Sweet Cherries	NC	NC	3,533.2	4,557.9					271.3
Tangerines	4,500.0	26,550.0	4,076.8	2,405.31			90.9	24,144.69	297.2
Watermelon	57,200.0	972.4	3,397.33	5,775.47			40.7	3,948.53	2,022.2
Fats and Oils									
Butter	NC	NC	12,502.2	25,004.4					
Lard	3,193.1	1,693.62	7,066.46	3,745.22	54.8	2,052.6			m
Margarine	NC	NC	31,255.45	24,504.28					
Oils	NC	NC	62,782.7	99,824.49					
Shortening	NC	NC	51,367.67	39,039.43					
Grains									
Barley	0.0^h		3,261.44	1,141.50	100.0				906.0
Cornmeal	22,000.0	7,260.0	20,927.58	6,906.1			4.9	353.9	3,737.1
Corn Starch	NC	NC	5,163.84	3,253.29					
Oats	NC	NC	8,697.17	6,957.74					4,996.1

(Continued on next page)

ARIZONA FOOD IMPORTS

COMMODITY	PRODUCTION		CONSUMPTION						
	Retail Weight (1,000 lbs)	Retail Value ($1,000) (1981 dollars)	Retail Weight (1,000 lbs)	Retail Value ($1,000) (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Area Required to produce 100% of AZ Consumption
Rice	NC	NC	25,004.37	13,752.40					5,449.9
Rye	NC	NC	2,174.0	869.72					2,313.4
Wheat Flour	192,600.0	42,372.0	326,143.92	71,751.66	40.9	29,379.66			67,946.6
Processed Fruit									
Dried Fruit	NC	NC	8,398.21						
Fruit/Canned	NC	NC	52,726.6						
Frozen Fruit	NC	NC	6,984.81						
Orange Juice	NC	NC	152,825.6						
Miscellaneous									
Coffee, Tea, Cocoa	None	None	32,342.6	102,202.61	100.0				NA
Honey	4,620.0	7,854.0	3,533.27	6,006.55			23.6	1,847.45	
Maple Syrup	NC	NC	271.8	1,329.10					
Peanuts	NC	NC	19,296.85	45,154.63					7,421.9
Sugar (Beets)	54,496.0[i]	19,073.06	257,925.5	90,273.9	78.9	71,200.3			49,601.0
Tree Nuts (Pecans)[j]	1,775.05	11,360.32	4,892.2	31,310.08	63.7	19,949.76			27,913.7
TOTALS	3,758,901.89	1,980,149.90	3,455,033.7	2,713,240.96		662,696.41		1,085,310.94	3,446,622.39

Arizona Food Imports Chart

Footnotes

a. Production weights are from 1980 Arizona Agricultural Statistics; Arizona Fruit and Vegetable Shipments Crop Year 1979-80; the Arizona Crop and Livestock Reporting Service; and the University of Arizona Department of Agriculture.

b. Prices were supplied by the U.S. Department of Labor, Bureau of Labor Statistics; Safeway Supermarkets, Tucson; and Food Conspiracy Co-op, Tucson.

c. Consumption in Arizona based on per capita consumption figures as they appear in Food Consumption, Prices, and Expenditures, Statistical Bulletin No. 656 (Washington, D.C.: GPO, 1980).

d. These production figures are generous, they assume no loss or waste between the producer and the consumer.

e. Insignificant production - quantity of production too small to be recorded.

f. 9,916,667 dozen.

g. NC - data not collected by any available source.

h. In 1980, Arizona produced 199,600,000 lbs. of barley, but all of this was used for livestock feed.

i. Sugar production and land requirements based on sugar produced from beets.

j. Consumption figure based on per capita consumption of all nuts, excluding peanuts. Production figures are for pecans exclusively, which are the only tree nut grown on a large scale in commercial operations in Arizona.

k. Veal is a by-product of the dairy industry.

l. Dairy cattle in Arizona are almost entirely lot-fed. Land requirements reflect acreage needed to grow necessary grains for feed.

m. Lard is a by-product of hog slaughter, land requirements are covered under pork.

Appendix 2

Arizona Food System Organizations

There are many organizations which, directly or indirectly, are working toward developing a sustainable food system in Arizona. The following is a selective list of organizations working with consumers, farmers, and the food industry of Arizona.

Agricultural Communicators in Education
314 Agricultural Building
University of Arizona
Tucson, AZ 85721
(602) 626-4999

Arizona Association of Conservation Districts
P.O. Box 66
Kirkland, AZ 86362
(602) 442-3254

Arizona Jojoba Growers Association
c/o William Howard O'Brian
4350 E. Camelback
Suite 210E
Phoenix, AZ 85018
(602) 959-6070

Arizona State Extension Services
Dr. Roy Rauschkolb, Director
Tucson, AZ 85721
(602) 626-4829

Central Arizona Project Association (for water resources)
1124 Arizona Title Building
Phoenix. AZ 85003

Cooperative Extension Service
Howard E. Jones, 4-H
Norma Redeker, Home Economics
Edward Parnee, Community and Rural Development
College of Agriculture
University of Arizona
Tucson, AZ 85721
(602) 626-0111

Desert Botanical Garden
John H. Rhuart
P.O. Box 5415
Phoenix, AZ 85010
(602) 941-1217

El Pueblo Center
101 W. Irvington Rd.
Tucson, AZ 85714
(602) 791-4546

Food for the Hungry International
Dr. Larry Ward, President
7729 E. Greenaway Rd.
Scottsdale, AZ 85260
(602) 998-3100

Freedom from Hunger Foundation/ Meals for Millions
Cynthia Anson, director
P.O. Box 42622
Tucson, AZ 85733
(602) 624-7963

Governor's Commission on Arizona Environment
206 S. 17th Avenue
Phoenix, AZ 85007
(602) 261-7803

Hunger Action Center
715 N. Park
Tucson, AZ 85719
(602) 623-7575

Inter-Tribal Council of Arizona
124 W. Thomas Road
Suite 301
Phoenix, AZ 85013
(602) 248-0071

Second Harvest
1001 North Central Avenue
Suite 303
Phoenix, AZ 85004
(602) 252-1777

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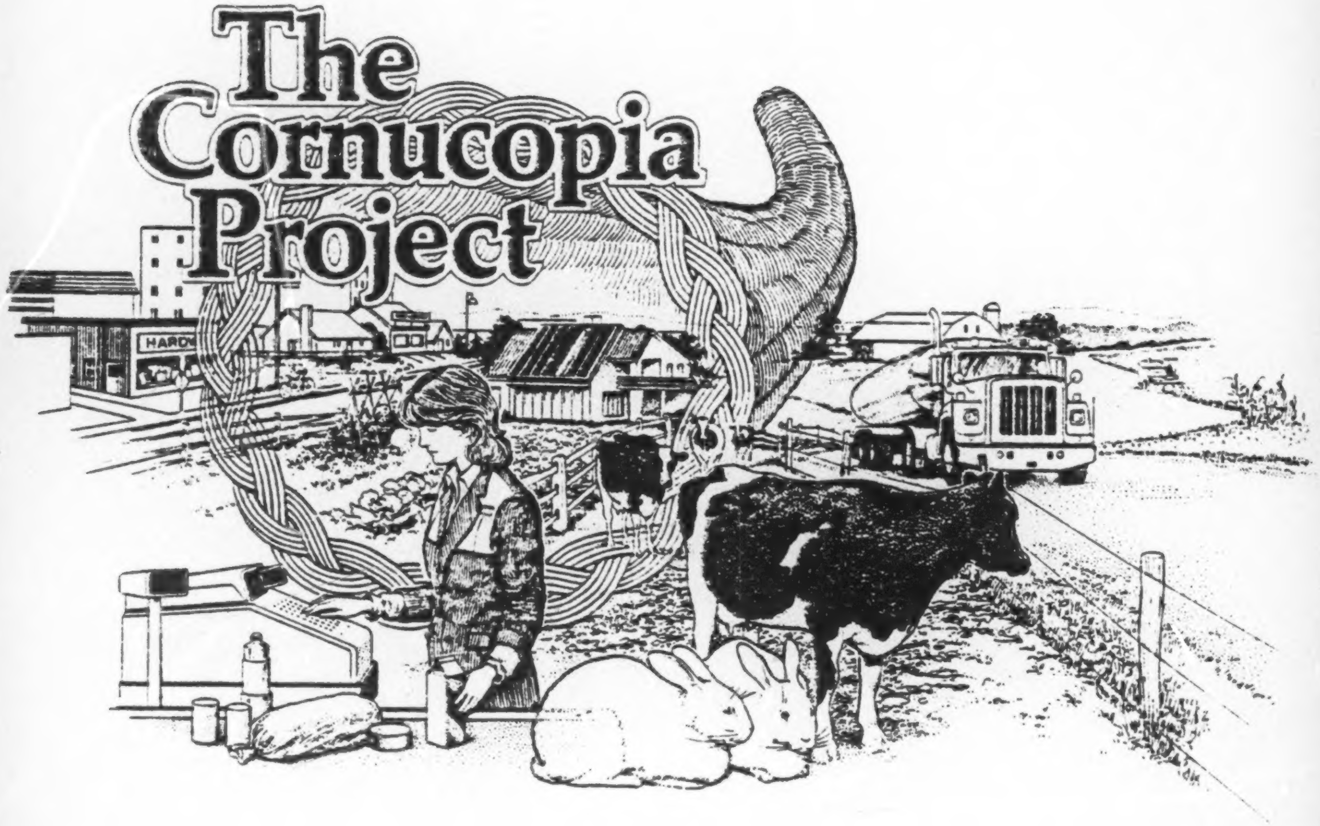
The
Cornucopia
Project
HARDW

THE DELAWARE FOOD SYSTEM: FIRST RATE FOR THE FIRST STATE

A Study of the Food System of Delaware by
DENNIS W. KEISER
and
The Cornucopia Project of Rodale Press

33 East Minor Street
Emmaus, Pennsylvania 18049
(215) 967-5171
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INTRODUCTION

Delaware: The name conjures up many images. To many it's a suburb of Baltimore or a city in Maryland, and not a state at all, but to the residents of this unique state, it has characteristics and potentials not found anywhere else on the eastern seaboard. To the business world, Delaware is the corporate headquarters of such industries as DuPont and Hercules, as well as being a major producer of chemical products. To the tourist, Delaware is an area of pleasant beaches and vast recreational facilities. But to the citizens of the state, Delaware possesses one of the finest agricultural areas in the United States.

Agriculture is the number one industry in the First State, employing over 30,000 individuals, on and off the farm, from production to agricultural supplies, from processing to wholesale and retail distribution. This is eleven percent of the Delaware workforce, and rivals its well known chemical industry.[1]

Delaware has a greater percentage of its land under till than any state in the northeast. It has an estimated 679,000 acres of farmland, which is about fifty percent of the state's total landmass.[2] This is the combined land totals of 3,632 farms.[3] In 1979 these farms produced a total of over $350 million in agricultural and livestock products.[4]

Nationally, Delaware is known as one of the largest producers of mushrooms and broilers, with Sussex County being the number one broiler producing county in the United States.[5] Delaware has the unique characteristic of being able to use the same farming techniques as those employed in the midwestern part of the country, because of its flat terrain.[6] But at the same time, it has the benefit of a fishing industry along its eastern border. The state's landings of finfish and shellfish totalled $746,282 in 1979, producing such commodities as sea trout, crabs, clams, and lobsters.[7]

Being known as the state that launched a nation, Delaware was the breadbasket of the Revolution, supplying Washington's armies with food. Traditionally it was known as a truck farming state, as well as a leading peach producer. Up until the 1920's, Delaware was known as the Peach King, until the industry was devastated by blight.[8] This could have caused an economic disaster for the agricultural community, if it were not for the growing broiler industry. Research in the early decades of the twentieth century made it profitable to grow "hothouse chickens," and conditions on the Delmarva Peninsula were very favorable. By 1925, it was estimated that over 50,000 broilers were being grown in the region.[9]

The above statements appear to paint a very prosperous picture of the Delaware food system, but in reality there are several problems that are slowly emerging for the nation's second smallest state. In recent years Delaware has been experiencing a loss in farmland to urban sprawl and recreational areas;a transition from truck farming to grain production; a constantly increasing cost in the production of agricultural products, through the rising cost of energy, fertilizers, and equipment; a slowly dwindling number of vegetable processing plants; and a decrease in the size of the fishing fleet. This does not take into account the impact that can be caused by production levels decreasing in states which produce food commodities that cannot be produced in Delaware, nor the possible shortages which could occur due to such things as truckers' strikes or natural disasters, such as the med-fly invasion in California, plant diseases, or even New Castle Disease, which threatened Delaware's poultry industry just a few years ago.

This report will examine the stability of the food system in the state of Delaware, pointing out strengths and weaknesses, and making recommendations for improvements on how Delaware can have a more efficient system of food production.

THE FACTS

1. Land Use in Delaware

According to the 1980 Census of Agriculture, about 620,000 acres, or about half of Delaware's land area is in farms,[10] which is the greatest percent of land in till for any state in the Northeast.[11] Land in farms reached a peak in the 1880's, with 1,090,000 acres, or 86 percent of the state's total land area.[12] It has been slowly decreasing ever since. (See Figure I). This loss is mainly due to urbanization, recreation, and tourism. In New Castle County 67 percent of the land urbanized between 1954 and 1974 was prime farmland.[13] Also, the recent development of state parks and wildlife refuges has taken up good farmland.[14] And, with tourism playing a major role in the beachfront areas, farmland is being used for the development of tourist housing. Recommendations of the Delaware Tourism Policy Study of 1979 called for a large scale development of 3,000 acres in Sussex County, to be used for 9,000 seasonal dwellings.[15]

Much farmland is idled for reasons other than the ones above. The land has become uneconomical to farm, such as where steep slopes or small fields did not permit efficient use of modern farm machinery, or where poor drainage kept crop yields low.[16]

But although the amount of land in farms is slowly decreasing, the acres harvested is slowly increasing, as can be seen in figure I. This is due to the turning over of more woodland and pasture for cultivation, because of the loss of cropland. Such new cropland is often less productive and more costly than the farmland it replaced. Delaware has

Figure 1: Number of farms, land in farms, and cropland harvested, Delaware, 1920-1978

Year	Number of Farms	Land in Farms (1000 acres)	Cropland Harvested (1000 acres)
1920	10,300	944.5	448.4
1925	10,300	899.6	404.2
1930	10,000	900.8	407.6
1935	10,400	921.3	388.7
1940	9,500	895.5	378.4
1945	9,300	923.3	416.2
1950	8,300	851.2	389.3
1954	6,500	814.3	412.3
1959	5,700	762.5	416.4
1964	4,800	717.0	418.5
1969	4,000	673.9	423.0
1974	3,600	630.6	451.8
1978	3,600	679.0	500.4

Sources: Figures for the years 1920-1969 were taken from Delaware Agricultural Statistics, Historical Series, 1866-1974, compiled by R. C. Smith, Department of Agricultural Economics, University of Delaware, Newark, DE, and John Witzig, Maryland-Delaware Crop Reporting Service. (Agricultural Experimental Station University of Delaware, Bulletin No. 419), Sept, 1976, p. 5.

Figures for the years 1974 and 1978 were taken from Delaware Farm Income, Crop and Livestock Production 1979, compiled by Raymond C. Smith, Department of Agricultural Economics, Agricultural Experiment Station, University of Delaware, Newark, Delaware (A. E. Pamphlet No. 71), Feb. 1981, p. 15.

relatively little pasture left and not much of the remaining woodland can be economically brought into cultivation.[17] Because of pastureland being converted to farmland, the livestock population is slowly decreasing.[18] This is a very dangerous trend.

Between 1975 and 1979, Delaware lost 45,000 acres of land in farms,[19] and if this continues at a rate of about 10,000 acres per year, only about 35 percent of the total land area will be in farms by the year 2000.[20]

Another aspect to consider is Delaware's soil erosion rate. It has been estimated that the erosion rate is 3.32 tons per acre each year within the state. Although the national average is much higher, 4.7 tons per acre according to R. Neil Sampson,[21] many critics feel that Delaware's rate is still too high. The contributing factor is the large percentage of farmland used for corn production to support the broiler industry. Delaware's flat terrain, plus the strong promotion of no-tillage planting techniques, help to contribute to the low erosion rate. Research and promotion of the University of Delaware and state and federal agricultural officials have strongly encouraged and increased agricultural practices such as no-tillage and the use of clover and vetch as cover crops to reduce soil erosion.

2 . Delaware's Agricultural Commodities

If one considers, from a financial viewpoint, that Delaware's per capita net farm income ranks third or fourth in the nation (right behind California and Florida), with farmers bringing in over $334 million in 1980,[22] it seems that the agricultural community is on solid ground. But when looking at whether Delaware can feed its people, the state is in trouble. Delaware exports 79 percent of the food it produces, and imports 74 percent of what its people consume (See Delaware Food Import-Export Chart). About ten percent of the commodities consumed in Delaware (coffee, tea, citrus fruits, etc.) could never be produced in the state because of climatic and soil conditions. But this means that 64 percent of what is imported could be produced in the state. This is not being done. Why? The businessman, whether he is a broiler producer, vegetable grower, grain producer, or fisherman, will always produce commodities for which he has an assured market. As long as all present factors hold true and there is no threat of disease, energy crisis, a truckers' strike, or whatever factors threaten a food system, he will never be able to compete with the food markets of Florida, California, or foreign countries who can produce a commodity for less money than he can. This is what is affecting what is produced in Delaware. But if these factors were to change, and producers could find more of a local market within the state, they would be capable of providing for these markets. But until that need arises, Delaware will never be a self-sufficient producer of foodstuffs.

Sussex County is the number one broiler producing county in the nation, bringing in over $190 million in 1981, which is over half of Delaware's farm income. Large amounts of corn and soybeans are grown on the Delmarva Peninsula (Delaware, eastern Maryland, eastern Virginia) to support the broiler industry throughout the region. Cash farm income for corn and soybeans was more than $83 million in 1979. The combined "broiler-corn-soybean complex," as Gerald Vaughn calls it, accounts for three-fourths of Delaware's cash farm income.[23]

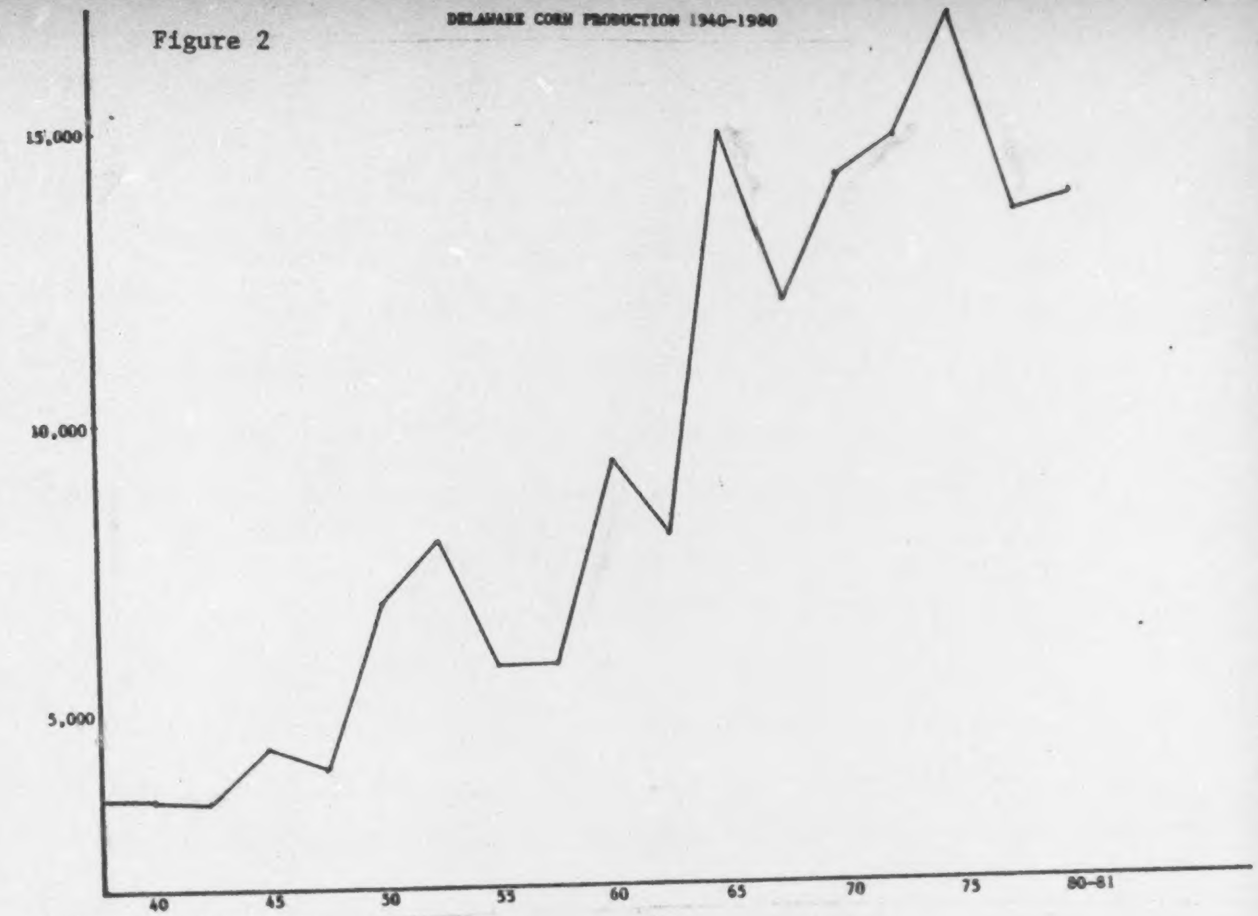
Other commodities which are grown in large quantities for export include mushrooms, beans, peas, cucumbers, and watermelons.

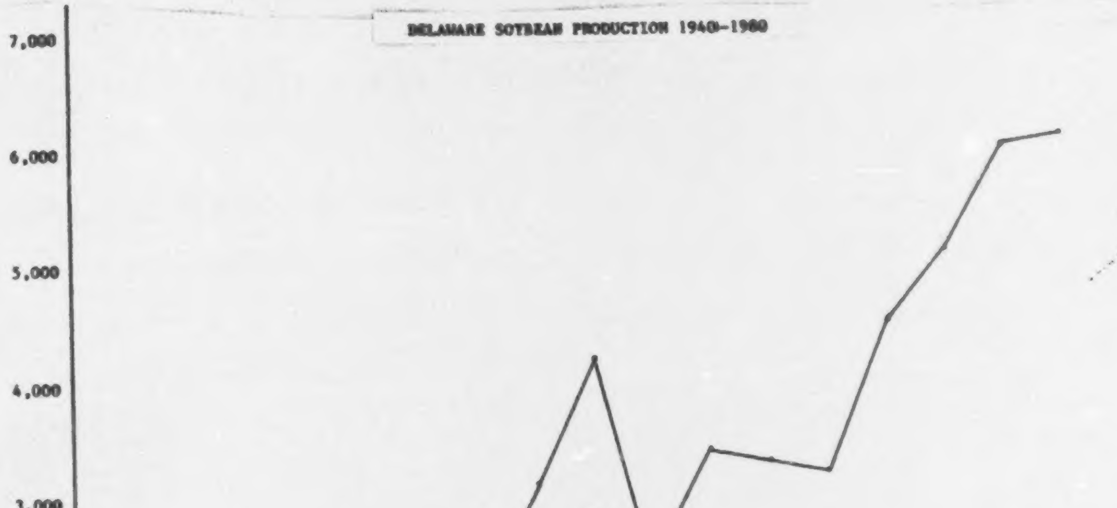
If Delaware produces huge amounts of a few commodities, then it is not producing other foods which its citizens consume, many of which could very easily be grown, considering the state's climate and soil and water conditions. This was not always the case. In the past, Delaware was more of a vegetable growing state, with more variety being produced. For example, the state once produced sweet potatoes, tomatoes, strawberries and canteloupes in fairly large quantities. These foods are still grown in Delaware, but in such small quantities that production figures are no longer collected. Obviously, Delaware cannot produce fresh vegetables and fruits year-round, but it can provide its citizens with these commodities four months out of the year. With a revitalized food processing industry, the state could process and package quantities for year-round use.

At the same time, production of grains has increased (see Figure 2), for two reasons: to support the growing poultry industry and to make bigger profits in farming.

As vegetable growing becomes less profitable, the variety grown will decrease. Much more money is made from growing broilers or grains or from vegetables that have two growing seasons (such as peas and beans). This is partly due to the large expensive irrigation systems needed to support farming in many areas of the state. Delaware receives adequate rainfall (about 42 inches, while about 20 inches is used per year[24]), but about 43 percent of Sussex County farmland is "moderately to severely

Figure 2


DELAWARE CORN PRODUCTION 1940-1980


DELAWARE SOYBEAN PRODUCTION 1940-1980

Adapted from Delaware Agricultural Statistics, Historical Series 1866-1974, Bulletin No. 419, Agricultural Experiment Station, University of Delaware, Newark, Delaware, September 1976, pp. 11 & 13. 1976-1980 figures adapted from Delaware Farm Income, by R. C. Smith, University of Delaware, Newark, Delaware, 1977 to 1980 issues, pp. 10-11.

limited by sandiness and low available moisture capacity".[25] This farmland must be irrigated because its sandy soils do not retain water.

The need for large expensive irrigation systems forces Delaware's farmers to produce commodities which will bring them high cash returns. For example, for every hundred acres of irrigated land, it costs an estimated $30,000 for a six-tower overhead irrigation system, plus $16,000 to drill the well and fixtures, plus an additional $10,000 for the power source. This does not include fuel costs for the diesel powered engines to run the irrigation system, or the license required in Delaware to dig the well, or yearly maintenence costs.[26] Another system of irrigation, more effective for vegetable growing, is the deep irrigation system. Estimated costs are $475 per acre, plus the extra costs of drilling the well, licensing, and maintenence.[27]

Another reason why the cost of farming is so high is because of the increased use of synthetic fertilizers, herbicides, and pesticides. Using these expensive chemicals even further encourages farmers to produce a high yielding cash crop, in order to cover their expenses and realize a profit.

Figure 3 shows the increased use of fertilizers in Delaware over the past thirty years. When compared to the national average, 111 pounds of fertilizer per acre,[28] the amount of manmade fertilizer used in Delaware is extremely high indeed. In 1974 commercial fertilizer cost Delaware farmers over $14 million, and almost $5 million was spent on pesticides and herbicides.[29]

With the exception of labor, perhaps the greatest single cost factor in food production is the use of petroleum products. This includes

Figure 3: Delaware Fertilizer Usage: Pounds Per Acre Cropped

Year	Acres Cropped lbs./A	Total Fertilizer lbs./A	Total Nutrients lbs./A	Total Nitrogen lbs./A	Total Phosphorus lbs./A	Total Potassium lbs./A
1942	403,900	184	40	4	19	16
1943	426,220	207	45	5	22	17
1944	439,120	204	43	6	24	16
1945	417,880	226	52	7	25	19
1946	403,400	266	60	8	30	20
1947	402,200	313	69	10	37	23
1948	406,570	266	60	9	37	22
1949	418,400	271	62	10	30	22
1950	422,720	279	65	10	31	24
1951	473,000	317	72	12	33	27
1952	440,500	370	91	16	39	35
1953	433,350	400	104	21	42	41
1954	446,750	423	115	23	44	48
1955	466,500	403	109	22	43	43
1956	481,400	358	100	21	39	39
1957	466,900	371	101	22	41	43
1958	462,350	364	103	21	40	42
1959	471,900	395	115	27	43	46
1960	499,800	358	103	24	38	41
1961	488,100	344	95	21	35	39
1962	482,200	369	105	25	36	43
1963	493,400	415	119	32	40	47
1964	496,450	424	130	38	43	50
1965	506,330	434	128	38	42	48
1966	492,900	518	150	40	50	60
1967	515,950	448	135	40	43	52
1968	481,800	504	162	50	51	61
1969	476,400	466	155	51	46	58
1979	477,000	480	166	56	44	67
1971	493,600	492	172	58	44	69
1972	488,250	462	164	55	44	66
1973	508,400	499	182	56	46	80
1974	532,800	480	184	56	44	84
1975	549,250	416	158	49	42	68
1976	545,860	494	176	62	37	77
1977	552,500	471	188	63	44	81

Courtesy of Professor Leo Cotnoir, College of Agriculture, University of Delaware, Newark, Delaware.

the manufacturing of pesticides, herbicides, and fertilizers; gasoline, diesel fuel, and oil lubricants to run farm equipment; heating oil; and the energy needed for processing and shipping food. Transportation is an especially high cost. The transportation cost for the food Delaware imports from other states comes to over $11.8 million every year.[30]

As a matter of economics, Delaware is putting all of its eggs in one basket -- the eggs in this case being broilers. The mainstay of the agricultural industry of Delaware and the Delmarva Peninsula is the broiler industry. We depend on other states to buy 96 percent of the broilers grown in Delaware.

This dependence on one commodity for such a large share of Delaware's economy can be dangerous. A recent outbreak of New Castle disease in the broiler industry could have had serious consequences. Fortunately, the disease was easily controlled, but this may not be the case the next time, and the Delaware broiler industry could go the way of the Delaware peach industry - bankrupted by disease.

3. Seafood Landings in Delaware

Although Delaware is a coastal state and benefits from a finfish and shellfish industry, it must import 81 percent of the finfish and 76 percent of the shellfish its citizens consume. Although per capita consumption of fish has increased 15 percent in the last thirty years, the poundage of fish landed in Delaware has remained pretty much the same.[31] However, the types of fish being landed have changed. There were twelve new varieties of finfish caught for sale in 1980-1981 that were not caught in 1970-1971. For example, such types of fish as spot and porgy are now available in the grocery store on a regular basis, replacing to some extent fish such as striped bass, whose landings have dropped 30 percent in the last ten years.[32]

The main change in Delaware's fish production has been in the size of the fishing fleet. (see Figure 4) The number of fishermen and boats has dropped by about fifty percent within the past ten years.[33] This reduction has been accompanied by a drastic drop in the pounds of fish caught for industrial use, but the food production levels have remained fairly steady.[34] Part of the decrease in Delaware's fishing fleet may be due to economics. Soaring interest rates and increased petroleum costs make buying and maintaining a fishing boat prohibitively expensive.

The shellfish industry has experienced a decrease in landings within the past ten years, but this, according to the College of Marine Studies, University of Delaware at Lewis, is because shellfish run in a twenty year cycle in productivity, with the twentieth year being a peak. The last peak in shellfish landings was several years ago.

Another point that should be brought out about the shellfish industry and its relatively low productivity level is the fact that the currents from the Delaware River flow down the Delaware side of the Delaware Bay, whereas the ocean currents flow up the New Jersey side of the Delaware Bay. This means that New Jersey has a seven times greater productivity level on its shoreline than Delaware does.[35] It has nothing to do with man-made problems such as pollution, but is a work of Mother Nature.

Figure 4: Commercial Fisheries* in Delaware: 1951-1979

Year	Number of Fishermen	Number of Boats
1951	1,706	403
1952	918	282
1953	1,050	349
1954	1,189	378
1955	1,321	378
1956	1,257	392
1957	1,434	431
1958	1,384	425
1959	894	363
1960	719	417
1961	781	420
1962	742	350
1963	662	198
1964	631	244
1965	520	263
1966	449	278
1967	445	218
1968	433	190
1969	462	242
1970	623	237
1971	714	285
1972	748	273
1973	779	252
1974	548	266
1975	487	220
1976	-	-
1977	473	276
1978	270	205
1979	295	192

*Fishing credited to ports within Delaware at which the fish are landed and sold on an open market.

Source: Dimensions on Delaware, A Statistical Abstract for 1979, prepared by the Office of Management, Budget, and Planning, Dover, Delaware, September, 1980, p. 579.

4. Meeting Demand

When you consider the location of Delaware and the advantages of having a two-crop growing season, the state could very well be the fresh produce grower not only for its own residents but for such neighboring metropolitan areas as Washington D.C., Baltimore, Philadelphia, and even New York. Although this would be on a limited basis, with mainly four months of harvest time out of the year, it could ease the cost to consumers for many fresh commodities. This is only accounting for fresh produce; there would be additional potential for processing and canning facilities. But the processing industry is declining in Delaware. The relatively small Delaware vegetable farms find it hard to compete with the consistant year-round production of California and other states.[36]

Delaware does have a large statewide network of U-Pick operations, roadside markets, and some farmers markets for direct marketing of fresh produce. But there is no central terminal wholesale marketing for small farmers wishing to sell their produce for packaging.[37]

Since there is no wholesale center in Delaware with which growers can deal in marketing their commodities, clearinghouses located in New Jersey, Maryland, and Virginia are more than anxious to accept any commodities that Delaware growers can provide them. This means that instead of local produce reaching Delaware's food stores, it winds up in other states.[38]

The only way that consumers in Delaware can get locally grown fresh vegetables is to go to a U-Pick operation or roadside stand. Some local supermarkets, such as Safeway and IGA do accept some local produce, and the Department of Agriculture will place signs in the stores labeling locally grown food, but this is an exception rather than the rule.

GOOD MARKS FOR DELAWARE: WHAT IS ALREADY BEING DONE

According to the Assistant Secretary of Agriculture, Mark Kooker, agriculture is Delaware's number one industry and the state's number one concern. Many new developments within the past few years are helping to improve the food situation in Delaware.

Some agricultural improvements are in the form of state legislation. A new law, entitled "The Delaware Agricultural Lands Preservation Act of 1981," has recently been passed to protect and preserve those areas in Delaware that are best suited for agricultural production.[39]

Although this bill has been signed into law, no formal course of action has yet been taken by the state to slow down the process of conversion of agricultural land to non-agricultural use. This is a sad point for Delaware, especially when one considers that its neighbor, Maryland, has actively, for the past four years, been purchasing the development rights to farms that are participants in the Department of Agriculture's program known as the Maryland Agricultural Land Preservation Foundation. Maryland has strongly promoted the necessity of agricultural land preservation. At this point in time, according to Delaware Department of Agriculture officials, the preservation program has been turned over to the county planning offices, and it will be their responsibility to implement some type of preservation program.

The law requiring licensing of all wells in the state acts as a regulatory system to prevent abuse of water reserves. Another law requires that commercial appliers of herbicides and pesticides must be licensed. In addition, commercial appliers as well as any other users of these chemicals must take state courses on their safe and proper use. There have been cases of licenses being revoked because of misuse or mismanagement of chemicals.[40]

A second area in which Delaware is working to improve the food situation is in research into better farming methods and alternative food sources. No-tillage farming is becoming more widely used. It is a process by which crops are "planted with minimal soil disturbance into some type of plant residue...(it) can save energy, or make it possible to use energy more efficiently, and has the potential to increase yields."[41] Other advantages to no-tillage are that it builds up the soil, reduces leaching and soil erosion by wind and water, and saves water.[42]

Research to improve agriculture within the state is being conducted at the University of Delaware. The University's College of Agriculture is experimenting with different farming techniques and land use. Research is also being done to increase broiler production while lowering costs. The College of Marine Studies at the University of Delaware is conducting research in the use of oyster and clam seedlings to seed beds and increase production of these shellfish. The College is also working on the growing of salt water plants, called halophytes, for human and animal food.

The University of Delaware is also doing research on how to improve the food system itself, in wholsale marketing of commodities, for example. They also help monitor food production and trends within the state. The University of Delaware, in conjunction with the State Department of Agriculture publishes many pamphlets for use by professional grain and vegetable growers, as well as for home gardeners.

The state of Delaware has a very strong agricultural community, with organizations such as the Grange, Delaware Farm Bureau, the Department of Agriculture, and the extension offices of the University of Delaware and Delaware State College. The Delaware State College extension office is working on home gardening with low-income families. One new organization, the Vegetable Growers Association, formed just a few years ago, is helping to organize these farmers, advising them of new techniques and research in vegetable production, and acting as a guide to available markets.

One interesting point and another plus for Delmarva is that another food commodity will soon be on the market. A fresh rabbit meat processing plant will be in operation in Greensboro, Maryland by the middle of 1982.[43]

RECOMMENDATIONS FOR CHANGE

It is very difficult to consider Delaware as an isolated state, since it is very small and depends on many resources and processing facilities located in both Pennsylvania and Maryland. It would be of great benefit, when looking at the Delaware food system, to conduct a study of the Delmarva Peninsula (eastern Maryland, the lower two-thirds of Delaware, and eastern Virginia), since the residents of the Peninsula interact as a community instead of looking at themselves as being parts of three different states. And when looking at northern Delaware, you must take into consideration northeast Maryland, southeastern Pennsylvania, and even part of southwestern New Jersey, because this is another distinct region, agriculturally, economically, and socially.

But even if Delaware is considered in this manner, it does not change the fact that it is in no way a self-sufficient state. And we cannot depend on Pennsylvania and New Jersey, because those states are just as dependent on California, Florida, and other states as Delaware is. Pennsylvania imports 71 percent of its consumption,[44] while New Jersey imports 82 percent of what its people consume.[45]

In order for Delaware to be self-sufficient in the crops it is able to grow, we would need about 247,000 acres of farmland (see Delaware Food Chart). Delaware now farms over 679,000 acres.[46] The state is a strong producer of some commodities, while being weak in others. The following list indicates some strengths and weaknesses in what Delaware produces:

Surplus Exported

- barley
- rye
- soybeans
- peas
- beans
- cucumbers
- sweet corn
- mushrooms
- potatoes
- apples
- watermelons
- chickens and broilers
- turkeys

Commodities Imported

- oats
- wheat
- asparagus
- beets
- broccoli
- cabbage
- carrots
- cauliflower
- celery
- eggplant
- garlic
- lettuce
- onions
- spinach
- sweet potatoes
- tomatoes
- canteloupes
- all fruits except apples
- all meats except chicken and turkey

All of these commodites are grown in Delaware to some extent, but they are grown in small quantities and the production figures are not recorded. Also, it should be remembered that production figures for home gardens or small farms with production sales under $2500 are not taken into consideration when the state collects agricultural production figures.

In addition to concentrating on the above commodities that we import, Delaware growers could possibly extend their growing season with several of the following cold weather crops: Chinese cabbage, brassicas, kale, parsnips, and Jerusalem artichokes.

Delaware, it must be remembered, has the advantage of two growing seasons for such crops as peas, broccoli, carrots, beets, lettuce varieties, cabbage varieties, and onions.

Also, recent research provided by the Rodale Research Center has found that the grain crop amaranth has a strong potential as a new food source. Certain varieties such as Gangeticus (Joseph's Coat) can be used not only as a grain crop but the leaves can be used as a spinach substitute. Amaranth has, in most cases, been looked upon as a weed, but has great potential as a new grain crop on the Delmarva Peninsula.

As mentioned earlier in this report, one of the problems in Delaware's agriculture picture is the slowly dwindling number of fresh vegetable processing plants in the state. It is strongly recommended that the Department of Agriculture, as well as the Delaware Development Office, make an all-out effort to conduct a feasibility study of the potential for new processing plants to be brought into the state, and promote this idea, if feasible, to investors and corporations. This would increase marketing advantages for vegetable growers. For example, Delaware could very well grow enough sugar beets to be self-sufficient in sugar production, if there was a sugar beet processing plant within the state.

The Cornucopia Project of Rodale Press brings out some points that would be of good advice to food industry executives and processing plant owners in the future:[47]

1. Long-term planning will become increasingly important;
2. Food transportation will have to be kept to a minimum, as the costs of petroleum products continue to rise;
3. Dependence on fresh food will increase;
4. Seasonal eating patterns will return;
5. The consumer will continue to grow in sophistication and understanding;
6. Food will begin to be viewed in new ways;
7. A revitalization in the discipline of home economics will occur.

Another strong recommendation is to develop a better statewide direct marketing outlet system, consisting of such things as roadside stands, farmers' markets, farm stores, and pick-your-own operations. It should be a joint effort of the Department of Agriculture and the farmers to promote this idea and encourage the consumer to support such a system. Some of the supporting facts that could be brought to the public's attention are:

By establishing a farmers' market "the benefits may include a 16 to 40 percent increase in income for farmers and a 17 to 70 percent cost savings to the consumers."[48]

"In Colorado consumers got an average 28 percent discount at farmer's markets compared to supermarket prices, while farmers got 44 percent higher returns than if they had sold through wholesale channels...A New York city study of direct marketing showed consumer savings ranging from 7 to 35 percent."[49] The effect of a healthy farm sector goes far beyond the farmer and the consumer. Each dollar of food produced by the farmer has a "ripple" effect in the rest of the economy. Figures vary from state to state, but in Pennsylvania it has been estimated that for each dollar the farmer produces in the crop sector, $1.81 is generated throughout the economy in total product.[50]

The next step that the citizens of Delaware can take to improve their food system is to grow their own foodstuffs, the most practical way being a backyard garden. A 1981 Gallup Survey, sponsored by Gardens for All, the National Association for Gardening, found that 38 million households -- 47 percent of all households in the United States -- had vegetable gardens in 1981. This is an increase of four million gardens over 1980.[51] And this figure does not include another seven million gardeners who grew some vegetables in containers on porches, patios, and decks.[52] The total yield from home gardens in 1981 was 19 billion pounds of vegetables, worth about $16 billion or about $414 per garden.[53] In 1981, the average family of four in the Northeast spent approximately $4000 to $6000 per year on food.[54] Even with a twenty-five dollar expenditurefor seeds and tools, a family could save six to ten percent on their yearly food bill by having a garden.

Although these facts are based on a national average, it is probably typical for Delaware as well. (The state of Delaware does not collect this sort of data.) It would be of great advantage to the Delaware food system if those who have the space to have a garden could be inspired to do so, and those who don't have the space were provided with an area in which to garden, either individually or collectively as a community project. There has been a growing movement nationally in urban areas to claim vacant lots for the production of community foodstuffs. A program such as this would help to improve the diets of many people, along with providing recreational opportunities for young and old alike, add some aesthetic qualities to urban areas, and also help to provide the people with a sense of worth and self-reliance.

Home and community gardens could produce nearly 80 percent of the total vegetables consumed nationally. It also has been found that "With some practice, an intensive gardener can have yields four to five times greater than the national average."[55] Community garden programs could be developed through state or community organizations, religious or civic groups, as well as in conjunction with programs working with the elderly, young people or the mentally handicapped. Depending on local zoning laws, such foodstuffs as quail, chicken, rabbits, and fish can be raised on very small plots of land. Citizens of Delaware could also take advantage of the hunting of waterfowl and small game, and fishing, crabbing, and clamming available in the state.

Beyond the production and harvesting of food, the promotion of home processing of foods should be encouraged, through organizations such as the extension service, and religious and civic groups. Home canning, freezing, and food drying could help to extend a household's personal harvest well into the winter months. (See Figure 5)

Figure 5

VEGETABLES FOR STORAGE

Beets. Pick mature vegetables before first killing frost. Pack in layers of damp sawdust or sand. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 4 to 6 months.

Brussels sprouts. Harvest after a few mild frosts. Store in perforated plastic bags. Requirements: 32 to 40° F., 90 to 95 percent humidity. Life: 3 to 5 weeks.

Cabbage. Pick firm, solid heads, and trim off loose outer leaves. Place heads on shelves, string them up by the roots, or wrap in newspaper and store in boxes or bins. (Beware: cabbage emits a strong odor during storage.) Requirements: 32 to 40°F., 80 to 90 percent humidity. Life: 2 to 4 months.

Cabbage, Chinese. Store only mature, solid heads picked before a severe frost. Store as with regular cabbage, or pack roots in damp soil or sand. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 4 months.

Carrots. Dig before any hard freezes. Store in cartons of sawdust, sand, or leaves. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 6 to 8 months.

Celery. Store in trenches in the garden, or place roots in boxes of sand or soil. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 1 to 2 months.

Endive, escarole. Pick after moderate fall frosts. Store with roots in soil or sand. Requirements: 32 to 40°F., 80 to 90 percent humidity. Life: 2 to 3 months.

Garlic. After curing, store in paper bags, or braid into strings and hang from rafters. Requirements: 35 to 40°F., 60 to 70 percent humidity. Life: 6 to 8 months.

Horseradish. Dig anytime in fall. Store in damp sand or sawdust. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 4 to 6 months.

Jerusalem artichokes. Mulch in garden or store in plastic bags or damp sand. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 1 to 2 months.

Kohlrabi. Remove leaves and roots. Store in damp sand or sawdust. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 3 months.

Onions. After curing, remove tops and store in bins or string bags, or braid and hang from rafters. Requirements: 35 to 40°F., 60 to 70 percent humidity. Life: 4 to 6 months.

Parsnips. Mulch in ground or store in damp sawdust, sand, or leaves. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 4 to 6 months.

Potatoes, sweet. After curing, wrap individually in newspaper and pack in baskets, or pack loosely (make sure potatoes aren't touching) in cartons of sawdust. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 3 to 5 months.

Potatoes, white. Late potatoes store best. After curing, pack in baskets or boxes. Don't store near apples, which give off a gas that promotes sprouting. Requirements: 32 to 40°F., 80 to 90 percent humidity. Life: 4 to 6 months.

Pumpkins. After curing, place on shelves or in boxes. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 4 to 6 months.

Rutabagas. Dig after a few mild frosts. Store in damp sand, sawdust, or moss. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 4 months.

Salsify. Mulch in garden, or store like parsnips. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 1 to 2 months.

Squash, winter. After curing, pack on shelves or in boxes. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 4 to 6 months.

Tomatoes, green. Pick mature green fruits before frost. They will gradually ripen at 55 to 70°F. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 4 to 6 weeks.

Turnips. Harvest before a heavy freeze. Store like carrots. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 4 months.

Source: Roger B. Yepsen, ed., Home Food Systems, Emmaus, PA: Rodale Press, 1981, p. 240.

One final recommendation dealing with local foodstuffs would be the promotion of foodbanks. Basically, a foodbank is a "nonprofit clearing house that gathers, stores and redistributes surplus food to charity. The food comes from diverse sources, including producers, retailers, grocery stores, farmers, and even families with large gardens. It is useable but not saleable for several reasons: items may have been over-produced or discontinued, produce may be the wrong size, or the merchandise may be out of date."[56]

The basis for all our agricultural production is the soil, a priceless resource that must be carefully preserved and maintained. The topsoil we use to grow crops is composed of weathered rock, organic matter, and living organisms. A soil's quality depends on how well these three elements are maintained. Erosion and over applications of synthetic fertilizers and pesticides can, over a period of time, diminish soil quality. For this reason, current production methods should be carefully examined in order to determine their full impact on the soil.

Synthetic agricultural chemicals should be used with discretion because of their dependence on petroleum. In times of oil shortage, these petrochemicals could become prohibitively expensive, or simply unavailable. Nationwide, the manufacturing of chemical fertilizers and pesticides uses almost twice as much energy as field machinery.[57] Farmers who are familiar with and practice -- even on a limited basis -- less energy intensive methods of farming will be better prepared to handle any changes that might occur.

According to experts at the College of Agriculture of the University of Delaware, it is possible for the entire state to return to organic methods of fertilizing the soil. The poultry industry alone produces enough manure to fertilize 20,000 acres of corn. Sludge, paper wastes, leaves, and other organic wastes are also available for use as fertilizer. Because the level of industry in the farming regions of Kent and Sussex Counties is very light, it would be possible to use sludge from municipal sewage treatment plants.[58]

Conversion from an energy intensive, petrochemical-based farming system to a more sustainable organic method requires careful consideration and planning. In his book Small is Beautiful, E. F. Schumacher recommends that farmers set aside a small portion of their cropland -- as little as five percent -- and use more traditional, organic methods of farming. This would provide farmers with a system for comparing different systems, as well as keeping their knowledge current, in the event a complete changeover to organic methods was suddenly required.[59] The state Department of Agriculture and University should also research and compare different farming systems, to determine what is best for the state's farmers and resources. Another proposal is to do a state research study comparing the farming practics of low technology farmers such as the Amish or Mennonites, to the higher-technological farmers of the region.

In conducting this study, one of the problems encountered was that there was not a central location for data pertaining to production of food in Delaware. Information was found scattered throughout several governmental and educational institutions. It is recommended that the state implement, as part of the Department of Agriculture, a division known as the Food Resource Data Center. It would be this agency's job to:

1. Monitor food production at all levels within the state, and keeping track of minor crops to a more efficient level.
2. Make recommendations as to the best regional varieties of crops to be grown, both on large commercial and home gardening scales.
3. Be a clearinghouse for information dealing with the preparation and processing of foods.
4. Hold workshops and public awareness programs on better consumer food production, purchasing and use.
5. Help in the establishing and implementing of direct marketing of locally grown produce.
6. Act as a technical assistant in the development of community gardens.
7. Provide a toll-free hotline for information about the location of local produce being sold.
8. Provide encouragement and work as a liaison in getting more local foodstuffs into more supermarket chains.
9. Provide labels and in-store displays stating "Grown in Delaware" for use on canned and frozen products.

Some of these things are being done, but the services are scattered between different governmental and educational institutions. A Food Resource Data Center would provide these services more efficiently.

EMERGENCY FOOD PLAN

A final recommendation is for the state to draw up an emergency food plan. This recommendation is to be looked upon as a food insurance program. The state could make recommendations to the public in the event of any type of disruption in the food system, whether it be manmade or natural disaster.

CONCLUSIONS

Although no one has all the answers to the problems facing the Delaware food system, this report was written to be used as a tool of guidance and as a stimulus for other individuals to investigate how they can improve upon the system through their own personal input. It is hoped that both governmental and educational agencies will take it upon themselves to use this report as a thought provoking document and look into the weaknesses which exist at the present time in both agricultural and marine food sources. From the standpoint of the individual citizen, it is only through each person's participation in this state food system that change can come about. Delaware can be known not only as the First State that launched a nation, but also as the First State that launched a program in food self-reliance.

Footnotes

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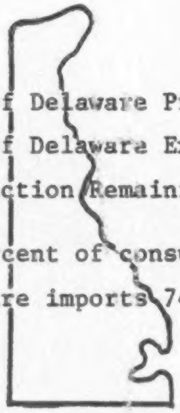
APPENDIX

Delaware contributed to the growth of our country by providing General Washington's armies with food during the Revolutionary War. Earlier in this century, Delaware's fresh fruits and vegetables were well known up and down the east coast. With 50 percent of its land under till, it's easy to see why agriculture is Delaware's most important business, bringing in cash receipts of over $350 million in 1979. In recent years, Delaware has turned from diversified truck farming to other areas, including the broiler industry and its support crops of corn and soy beans.

Despite those apparent successes, 74 percent of the food Delaware residents consume is imported from states as far away as Florida, Texas, California, and Oregon. Transporting this food (much of which could be grown in Delaware) from all over the country makes up $11.8 million of Delaware's yearly expenditures for food. Delaware can do many things to decrease its dependence on these long, vulnerable food supply lines. Consumers can adjust their eating habits and take advantage of foods that can be grown and processed in Delaware. A central marketing facility in Delaware would help farmers get a fair price for their food crops while providing grocery stores, schools, and other institutions with the quantity and quality of food they need. Research is needed to find varieties of crops best suited to Delaware's climate, terrain, and soil types. Low input farming, which employs only minimal irrigation, tillage, and chemical fertilizers and pesticides, needs to be tested and perfected on Delaware farms. Through these and other steps, Delaware's food and agriculture system can become a sustainable, productive means of feeding Delaware residents.



Retail Value of Delaware Production	$ 373,545,000
Retail Value of Delaware Exports	294,751,900
Value of Production Remaining	$ 78,793,100

26 percent of consumption produced in Delaware

Delaware imports 74 percent of its food.

DELAWARE FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight[a] (1,000 lbs)	Retail Value[a] ($1,000) (1981 dollars)	CONSUMPTION Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of DE Consumption
Meat									
Beef & Veal	3,745.1	5,066.0	47,498.9	34,531.7	92.1	30,803.7			36,763.46[c]
Lamb & Mutton	0		773.8	359.8	100.0	359.8			476.18[d]
Pork	16,385.0	7,143.0	37,975.3	16,557.3	56.8	9,404.5			40,766.7[d]
Poultry									
Chickens & Broilers	758,823.0	197,650.0	30,118.4	6,023.7			96.0	189,744.0	8,436.5[e]
Turkeys	6,786.0	2,850.0	5,892.7	2,474.9			13.2	375.1	2,063.27[f]
Eggs	16,972.2[g]	7,928.0	21,011.4	9,817.2	19.0	1,865.3			9,013.6
Fish[h]									
Finfish	613.5	339.6	3,214.2	5,785.6	80.9	5,446.0			NA[i]
Shellfish	342.8	390.6	1,428.5	1,999.9	76.0	1,599.9			NA
Dairy Products									
Fluid Milk & Cream	129,000.0	16,344.0	138,687.4	17,371.7	7.0	1,227.4			NA[j]
Condensed & Evaporated Milk	0		4,464.2	474.9	100.0	474.9			NA
Butter	0		2,678.5	290.3	100.0	290.3			NA
Cheese	NC[k]		12,916.4	1,438.9					NA
Milk, Dry Whole & Nonfat	0		2,142.8	1,944.8	100.0	1,944.8			NA
Frozen Dairy Products	0		15,297.3	6,845.5	100.0	6,845.5			NA
Vegetables									
Asparagus	.45	222.0	178.6	873.4	74.6	651.6			192.63
Beans, Lima	17,140.0	2,340.0	1,785.7	326.8			89.6	2,082.6	1,062.92
Beans, Snap	24,400.0	2,062.0	773.8	65.4			96.9	1,996.6	155.38

(Continued on next page)

DELAWARE FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight[a] (1,000 lbs)	Retail Value[a] ($1,000) (1981 dollars)	CONSUMPTION Retail Weight (1,000 lbs)	Retail Value ($1,000) (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of DE Consumption
Vegetables (cont.)									
Beets	0		238.1	5.07	100.0	5.07			8.31
Broccoli	0		654.7	124.4	100.0	124.4			79.84
Cabbage	0		773.8	66.5	100.0	66.5			30.46
Carrots	0		3,333.3	363.3	100.0	363.3			124.38
Cauliflower	0		714.3	152.1	100.0	152.1			72.89
Celery	0		4,107.1	376.2	100.0	376.2			84.5
Cucumbers	15,380.0	984.0	2,380.9	152.4			84.5	831.6	278.79
Corn, Sweet	32,060.0	1,079.0	3,988.0	134.2			87.6	944.8	385.69
Eggplant	0		297.6	47.3	100.0	47.3			15.9
Escarole	0		357.1	67.8	100.0	67.8			26.7
Garlic	0		476.2	72.4	100.0	72.4			36.63
Green Peppers	0		1,964.2	390.9	100.0	390.9			211.2
Lettuce	0		14,344.9	1,477.5	100.0	1,477.5			882.76
Mushrooms	6,538.0	5,560.0	702.4	455.2			89.3	4,965.1	NA
Onions & Shallots	0		6,487.9	491.8	100.0	491.8			207.95
Peas	26,400.0	2,219.0	1,785.7	190.2			93.2	2,068.1	676.42
Potatoes	151,800.0	8,416.0	29,404.1	1,617.2			80.6	6,785.8	1,336.55
Spinach	0		357.1	15.4	100.0	15.4			24.03
Sweet Potatoes	0		2,321.4	200.3	100.0	200.3			201.86
Tomatoes	3,166.0	107.0	6,547.5	221.3	51.6	114.2			218.9
Other Vegetables[1]		4,056.0							
Vegetables, Canned									
Asparagus	NC		178.6	292.9					235.01
Beans, Lima	NC		178.6	98.2					129.69
Beans, Snap	NC		3,511.8	1,313.4					502.09
Beets	NC		595.2	313.6					26.81
Carrots	NC		297.6	189.7					14.8
Corn, Sweet	NC		3,214.2	1,189.3					373.02
Peas	NC		1,904.7	696.2					533.17
Pickles	NC		5,178.5	7,508.8					451.15
Sauerkraut	NC		595.2	177.1					43.56

(Continued on next page)

DELAWARE FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight[a] (1,000 lbs)	Retail Value[a] ($1,000) (1981 dollars)	CONSUMPTION Retail Weight (1,000 lbs)	Retail Value ($1,000) (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres requimd to produce 100% of DE Consumption
Vegetables, Canned (cont.)									
Spinach	NC		476.2	331.9					28.87
Sweet Potatoes	NC		595.2	345.2					66.87
Tomato Products	NC		14,047.3	9,112.1					729.4
Vegetables, Frozen									
Asparagus	NC		47.6	177.2					61.61
Beans, Lima	NC		297.6	300.6					204.95
Beans, Snap	NC		660.7	572.8					176.85
Broccoli	NC		797.6	748.0					116.72
Carrots	NC		636.9	514.3					39.59
Cauliflower	NC		291.7	314.9					35.72
Corn, Sweet	NC		1,238.1	1,304.9					143.69
Onions	NC		404.5	334.5					16.94
Peas	NC		1,011.9	950.4					416.64
Potato Products	NC		43,987.4	37,097.4					4,438.7
Spinach	NC		422.6	287.4					28.44
Fruits, Fresh									
Apples	13,000.00	1,218.0	9,702.2	941.1			25.4	309.4	481.25[m]
Bananas	NA		12,559.2	4,018.9					NA
Cantaloupes	0		4,642.8	5,199.9	100.0	5,199.9			336.43
Cherries	0		357.1	192.8	100.0	192.8			371.9[n]
Grapes	0		1,964.2	232.7	100.0	232.7			431.7[n]
Peaches	1,500.0	195.0	3,095.2	404.2	51.5	207.4			153.53[m]
Pears	0		1,428.5	209.9	100.0	209.9			204.07[n]
Plums & Prunes	0		952.4	99.1	100.0	99.1			146.5
Strawberries	0		1,011.9	387.6	100.0	387.6			306.64
Watermelons	26,600.0	1,381.0	6,547.5	339.8			75.4	1,041.3	467.68
Citrus Fruits[o]	NA		14,166.2	6,233.2					NA

(Continued on next page)

DELAWARE FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight[a] (1,000 lbs)	Retail Value[a] ($1,000) (1981 dollars)	CONSUMPTION Retail Weight (1,000 lbs)	Retail Value ($1,000) (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres required to produce 100% of DE Consumption
Other Fresh Fruits[p]		267.0							
__Fruits, Processed__									
Apples	NC		4,702.3	3,555.0					279.9
Peaches	NC		2,571.4	1,491.4					153.05
Pears	NC		1,071.4	538.2					183.7
Citrus	NA		13,225.9	21,901.7		21,901.7			NA
__Fats & Oils__									
Lard	884.8	99.0	1,488.0	163.7	40.5	66.3			NA[q]
Margarine	NC		6,666.5	5,266.5					
Shortening	NC		10,952.1	8,214.1					
Soybean Oil	87,434.1	48,662.0	25,297.1	15,937.2			71.0	34,550.0	76,671.82
__Grains__[r]									
Barley	54,000.0	1,171.0	714.3	24.6			98.7	1,155.8	321.81
Corn	539,050.6	48,547.0	9,464.1	852.4			98.2	47,694.7	2,932.4
Oats	NC		1,845.2	7.8					1,048.41
Rice	NA		5,595.1	615.5					NA
Rye	5,376.0	192.0	416.7	20.5			92.3	177.0	310.04
Wheat	44,347.8	3,450.0	71,308.0	6,806.3	37.8	2,603.8			48,237.65
Sugar	0		53,153.6	669.7	100.0	669.7			1,355.96
Maple Syrup	NC		59.5	760.9					NA
Honey	128.0	95.0	714.3	530.0	82.0	434.6			NA
Coffee, Tea, Cocoa	0		6,904.6	33,034.6	100.0	33,034.6			NA
Tree nuts	NC		1,011.9	414.9					
Peanuts	0		4,047.5	837.8	100.0	837.8			NA
TOTALS	1,981,873.4	373,545.0	766,280.5	298,076.07		130,956.77		294,751.9	247,043.13

Notes:

a. Most retail weights, retail values, and production per acre figures are taken from one of the following sources: Raymond C. Smith, Delaware Farm Income, Crop and Livestock Production, 1979, University of Delaware Agricultural Experiment Station, Newark, DE, A.E. Pamphlet No. 71, Feb. 1981. Dimensions on Delaware, A Statistical Abstract for 1979, Office of Management, Budget, and Planning, Dover, DE, Sept. 1980, Document # 10-03/80/09/02. Agricultural Statistics 1980, USDA, Washington, D.C.

b. Consumption figures are taken from USDA Statistical Bulletin No. 672, Food Consumption, Prices, and Expenditures, 1960-1980.

c. Based on 3.2 lbs. corn plus 10.1 lbs. silage needed to produce one lb. beef (University of Delaware, College of Agriculture).

d. Computed from formula, p. 18 of The State of Your Food, A Manual for State Food Systems Analysis, Cornucopia Project, Rodale Press, Emmaus, PA.

e. Based on 2 lbs. corn per 1 lb. chicken (University of Delaware College of Agriculture).

f. Based on 2½ lbs. corn per 1 lb. turkey (University of Delaware College of Agriculture).

g. 130 million eggs.

h. Weights and retail values of seafood were supplied by the Department of Natural Resources and Environmental Control, Division of Fish and Wildlife, Dover, DE.

i. Not applicable.

j. A "not applicable" label was given to land requirements for all dairy products because Delaware does not have the quality of grazing land that it needs to support dairy farming to a self-sufficient level. (University of Delaware College of Agriculture).

k. Not collected. Delaware does have a cheese processing plant but it is believed that the milk is imported from Pennsylvania. No figures on cheese production were available.

l. Includes sweet potatoes, broccoli, brussels sprouts, cabbage, carrots, cauliflower, green peppers, spinach, and miscellaneous vegetables.

m. Figures for apple and peach production are based on orchards at least three years old, with 140 trees per acre producing 3 bushels of fruit per tree. (Kent County Cooperative Extension Service, Dover, DE).

n. Computed from Pennsylvania figures (Cornucopia).

o. Includes oranges, grapefruits, and lemons.

p. Includes strawberries, and miscellaneous fruits and nuts.

q. Not applicable. Lard is a by-product of pork processing.

r. Total production figures of grains were used to convert to flour and other food products. The figures show Delaware's potential for human food production in grains.

s. Sugar from beets.

Delaware Organizations List

There are many organizations which directly or indirectly are working towared developing a sustainable food system in Delaware. The following is a selective list of organizations working with consumers, farmers, and the food industry in Delaware.

Delaware Agriculture Museum Association
866 N. DuPont Highway
Dover, DE 19901
(302) 734-1618

Delaware Association of Conservation
Districts
Agricultural Hall
University of Delaware
Newark, DE 19711
(302) 738-2506

Delaware Bankers Association,
Agricultural Committee
Robert F. Rider
O. A. Newton & Son Co.
Box 397
Bridgeville, DE 19933
(302) 337-8211

Delaware Beekeepers Association
John Landon, Secretary-Treasurer
R.D. #2, Box 56
Milton, DE 19968

Delaware Cooperative Extension
Service
Dr. Samuel M. Gwinn, Director
Agricultural Hall
University of Delaware
Newark, DE 19711
(302) 738-2504

Delaware Department of Agriculture
Donald J. Lynch, Secretary
Drawer D
Dover, DE 19901
(302) 736-4811

Delaware Farm Bureau
233 S. DuPont Highway
Camden, DE 19934
(302) 697-3183
John F. Walton, President
R.D. #1, Box 117
Magnolia, DE 19962
(302) 697-6960

Delaware Federal Land Bank
Association of Delaware
S. State Street & Rt. 13
P.O. Box 418
Dover, DE 19901
(302) 734-7534

Delaware State Grange
911 S. Governors Avenue
Dover, DE 19901
(302) 734-4653

Delaware Council of Farm Organizations
Joseph Jackewicz, Sr.
R.D. #1, Box 144
Magnolia, DE 19962

Delaware Council of Farmer Cooperatives
Fred C. Riblett
47 Tischer Dr.
Dover, DE 19901
(302) 697-2589

Delaware Crop Improvement Association
William Hutchinson, President
P.O. Box 222
Clayton, DE 19938
(302) 653-7111

Delaware Produce Growers, Inc.
Joseph Jackewicz, Sr. President
R.D. #1, Box 144
Magnolia, DE 19962
(302) 697-7681

Delaware Vegetable Growers Association
Ed Kee, Secretary-Treasurer
P.O. Box 340
Dover, Delaware 19901
(302) 736-1448

4-H Leaders Association
Mr. Rodney Reynolds, New Castle, Pres.
R.D. #1, Box 242
Smyrna, 19977
(302) 653-8729

Mrs. Rose Pritchett-Kent, President
R.D. #2, Box 306
Felton, DE 19943
(302) 284-4437

Mrs. Joy Huskill-Sussex, President
R.D. #5, Box 150
Harbeson, DE 19951
(302) 945-0820

Governor's Council on Agriculture
Earle Isaacs, Chairman
R.D. #1, Box 417
Ellendale, DE 19941
(302) 684-4526

Mid-Atlantic Food Processors Association, Inc.
P.O. Box 2497
Salisbury, MD 21801
(301) 546-5854

Delaware Directors:

Nazmy Elehwany
DelAgra Corp.
Bridgeville, DE 19933
(302) 337-8206

Will James
Draper-King Cole, Inc;
Milton, DE 19968
(302) 684-8555

Peninsula Horticultural Society
Wayne V. Shaff
Quantico Road
Salisbury, MD 21801

Southern Delaware Truck Growers Association, Inc.
Dual Highway & Georgetown Road
Laurel, DE 19956
(302) 875-3147

State Farmland Evaluation Advisory Committee
Dr. Donald F. Crossan
133 Agricultural Hall
University of Delaware
Newark, DE 19711
(302) 738-2501

University of Delaware College of Agricultural Science's and Experiment Station
Dr. Donald F. Crossan, Dean and Director
Agricultural Hall
University of Delaware
Newark, DE 19711
(302) 738-2501

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The Cornucopia Project

1982

THE NEW MEXICO FOOD SYSTEM:
TOWARD ABUNDANCE IN THE LAND OF ENCHANTMENT

A Study of the Food System of New Mexico

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with

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Preface

This report is a product of a study on New Mexico's food system. You ask: What's a food system? It's more than you might think; it goes far beyond the food production which takes place on the farm. The system includes the processing, distributing, marketing and consumption of food. Not to be left out are all the industries that help put food on our tables: manufacturers of equipment, chemicals, and packing materials are just a few. (See Chart 1). Finally, there's the energy foundation for the whole system: fossil fuels.

Here at the Cornucopia Project we've discovered much about our food system. It currently provides us with an abundance of food and a degree of choice unsurpassed anywhere else in the world. But to produce this abundance and degree of choice, we are using up our natural resources: soil, water, and energy. In the midst of plenty, we seem bent on devastating our potential for future productivity. These problems are not unique to New Mexico's food system; in fact, they are seen throughout the United States. They are of national and international magnitude.

Our purpose is not to paint hopeless pictures of a ravaged earth, but to point out the vulnerabilities and strengths of our food system. From there, we suggest some steps we can take to insure a sustainable and affordable supply of food, for ourselves, our children, and their children.

Chart #1

Soil
Water
Minerals

Food Production

- modern agriculture
- organic agriculture
- animal husbandry
- aquaculture
- greenhouses
- hydroponics
- urban food production

Food Processing

- drying
- cooling
- freezing
- freeze drying
- canning
- smoking
- salting
- pickling
- aging
- preservatives
- heating/cooking

Food Storage

- root cellar
- spring house
- ice box
- freezer
- refrigerator
- grain bin
- silo, barn
- warehouse
- cans, bins

Food Distribution

- truck
- rail
- ship, barge
- airplane
- car
- bicycle
- conveyor belt
- pipe
- animals
- humans

Food Procurement

- buy
- trade
- gift
- grow
- wholesale/retail
- grocery store
- supermarket
- roadside stand
- market stall
- food coop
- garden
- restaurant

Food Preparation

- boil
- simmer
- broil, braise
- bake
- barbecue
- fry
- freeze
- roast
- steam
- parboil
- reheat

Source: Adapted from Medard Gabel, Ho-ping: Food for Everyone (Garden City: Anchor Press/Doubleday, 1979).

INTRODUCTION

When Spanish explorers first arrived in New Mexico in the 1500's, they came upon the self-sufficient agrarian culture of the Pueblo Indians. In the 1850's, at the time of the United States' conquest of New Mexico, the area still had a self-supporting agrarian economy. Even to the present day, our own perception of belonging to a farming and ranching society has persisted. We take pride in living in the Land of Enchantment.

New Mexico of the 1980's, however, is a different place. Seventy percent of the state's populace lives in urban areas;[1] a third resides in greater Albuquerque. Our 1980 population of 1.3 million was 27.8 percent higher than the 1970 head-count.[2] We are no longer an agrarian society, despite our self-perception. Now, the center of the state's economy is mineral and petroleum production and federal government expenditures,[3] generating 3.5 to 5 times more revenue than agriculture.[4]

New Mexico still has a productive agriculture: Cash receipts for New Mexican farmers and ranchers totalled $1.85 million in 1980.[5] We lead the nation in chile pepper production.[6] We grow crops of national importance: pecans, peanuts, sorghum grain, lettuce and onions.[7] However, it is New Mexico's livestock industry that plays the largest role in the state's agriculture. Even though sales of cattle and calves generate over 60 percent of the state's total cash receipts from agriculture, New Mexico's national role in cattle is insignificant.[8] Our herds make up only 1.3 percent of the total number of cows and calves in the country.[9]

Despite the productivity, New Mexico's agricultural and food systems are in trouble. Over 56 percent of the food consumed in the state is imported from other states and countries.[10] Meanwhile, our own productive potential is being undermined by soil erosion, cropland loss, and diminishing water supplies. New Mexico has the nation's second worst rate of rangeland erosion and fourth worst rate of cropland erosion.[11] Between 1967 and 1977, New Mexico lost 100,000 acres of prime farmland to development; only slightly more than one-half million acres remain.[12] Sixty percent of the state's irrigated cropland is supplied with water from underground sources called aquifers,[13] and like the Ogallala Aquifer on the East Plains, these aquifers will be dry early in the next century unless present use rates are changed.[14]

It appears that these trends will make New Mexico even more dependent on out-of-state sources of food. At the same time, however, these sources of food are becoming less reliable and more expensive. If New Mexico is to build a strong and affordable food system and prevent disruptions of its food supply in the future, major changes must be made.

THE DISTURBING FACTS

New Mexico's agriculture produces over $1.1 billion a year in farm cash receipts; 87 percent of this is generated by only seven enterprises: cattle and calves, dairy, hay (mainly alfalfa), cotton, wheat, sorghum, and chile.[15] This lack of diversity is one of the major causes of our state having to import over 56 percent of its food. Yet while we import vast amounts of food, we export much of what we produce: cattle, sheep, dairy products, lettuce, onions, chile, peanuts and pecans.[16] New Mexico's farmers also harvest vast amounts of grain and other crops (Chart 2), but except for wheat (and possibly sunflower seeds), these crops are used for livestock feed.[18] While the single fact that we import over half of our food may not be alarming in itself, current practices and trends in the state's agriculture will not only increase our food dependence on other states, but will also threaten present agricultural production as well.

Loss of Farmland

It is hard to grow food without good land, and New Mexico is losing its cropland base, particularly irrigated cropland. While 82 percent of the state's 77.9 million acres is used for grazing livestock, less than 3.5 percent is in cropland, and only half of that is irrigated.[18] Between 1967 and 1977, 100,000 acres of prime farmland -- the best type of farmland -- were converted to urban uses. Only 524,000 acres of prime farmland remain, and if this conversion rate continues, no prime farmland will remain in 2030.[19]

Although New Mexico keeps losing prime farmland, the number of acres of cropland in the state actually increases. This occurs because new cropland is brought into production. The new cropland is not only of less than prime quality, but also in dwindling supply. Less than 500,000 acres of land having a high potential for conversion to cropland remain.[20]

Chart #2

New Mexico Grain and Feed Production

Crop	Production
Corn	7,225,000 bu.
Wheat	10,500,000 bu.
Barley	1,995,000 bu.
Sorghum	10,280,000 bu.
Oats	174,865 bu.
Rye	8,667 bu.
Sunflower seed	326,080 lbs.
Soy Beans	59,550 bu.
Corn silage	364,000 tons
Sorghum silage	138,000 tons
Alfalfa	132,000 tons
Other hay	112,000 tons

Sources: New Mexico Agricultural Statistics 1980 (Las Cruces: New Mexico Crop and Livestock Reporting Service, 1981), p.14; U.S. Department of Commerce, 1978 Census of Agriculture, Vol. 1, part 51 (Washington, D.C.: GPO, 1981), p. 415.

Decline in Number of Farms and Farmers

The number of farms in New Mexico has also dropped. Since 1935, two out of every three farms have gone out of business. Until 1975, there were only 12,000 farms left in the state. Since then, there has been an increase in the number of farms of over 13 percent, to the 1981 figure of 13,600 farms.[21] (Chart 3).

Although overall the number of farms has been decreasing, the size of New Mexico farms has actually increased. Between 1935 and 1941, farm size increased 400 percent, from 832 acres per farm to a high in 1974 of 4,170 acres.[22] Since then, average farm size has dropped almost 20 percent. (Chart 4). Part of the increase in farm size reflects increasing use of rangeland, which has limited productivity and requires careful management.

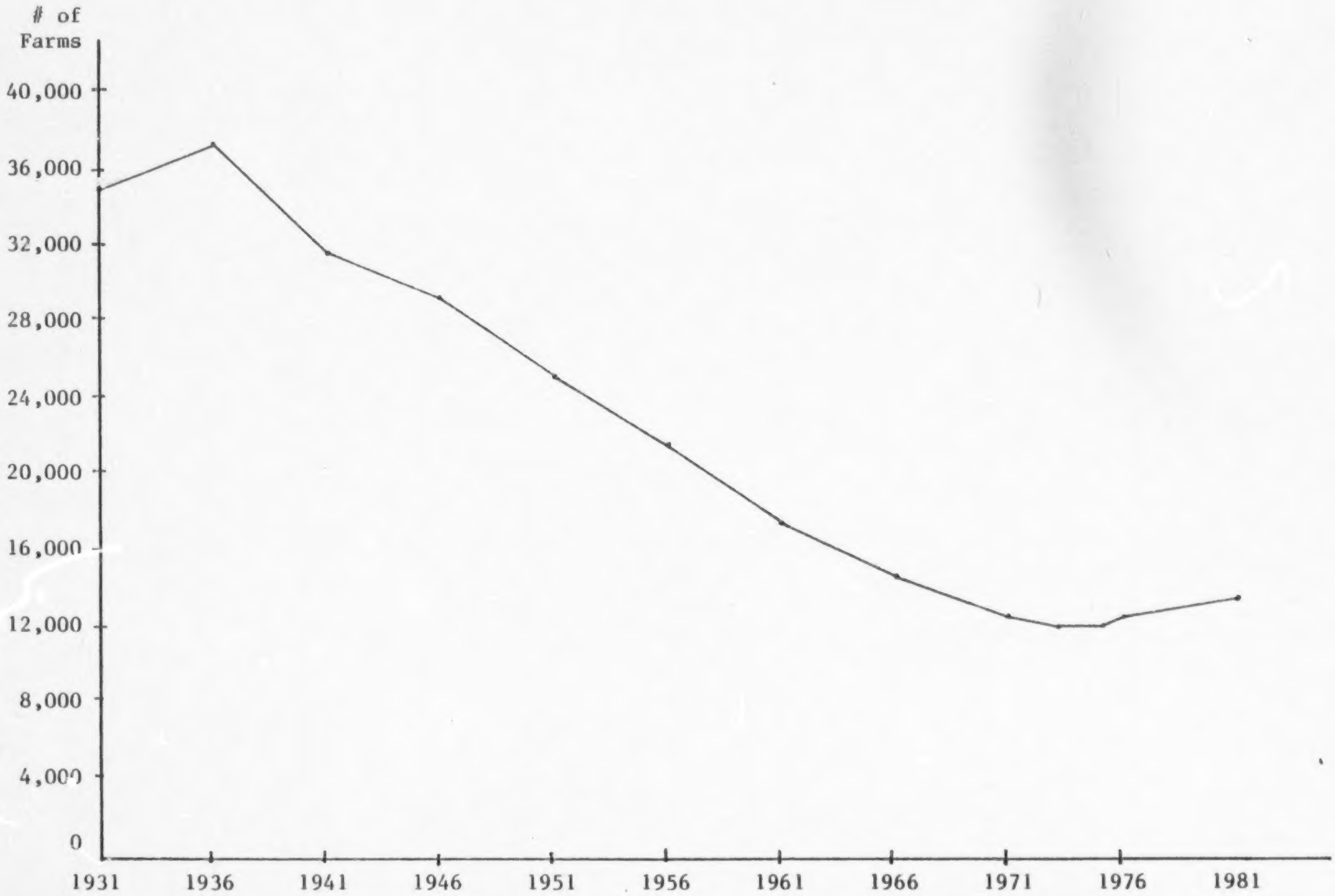
The full-time farmer is becoming a thing of the past. Fewer than half of the farm operators in New Mexico list farming as their principal occupation. Because of the poor economic climate of the last several years, many farmers have been forced to find part-time employment off the farm in order to make ends meet. Young people are discouraged from entering farming because of high start-up costs, uncertain economic conditions, and an array of health risks that make farming an economically and physically hazardous occupation.[23]

Farm Economics

Economically, farmers are in terrible shape. Farm income, in real dollars, is thought by some economists to be at its lowest point since the Depression.[24] And as real income drops, farmers' debts grow larger. Between 1960 and 1980, the farm real estate debt in New Mexico grew 480 percent to a record of $637 million (Chart #5).[25] By January 1981,

Chart #3

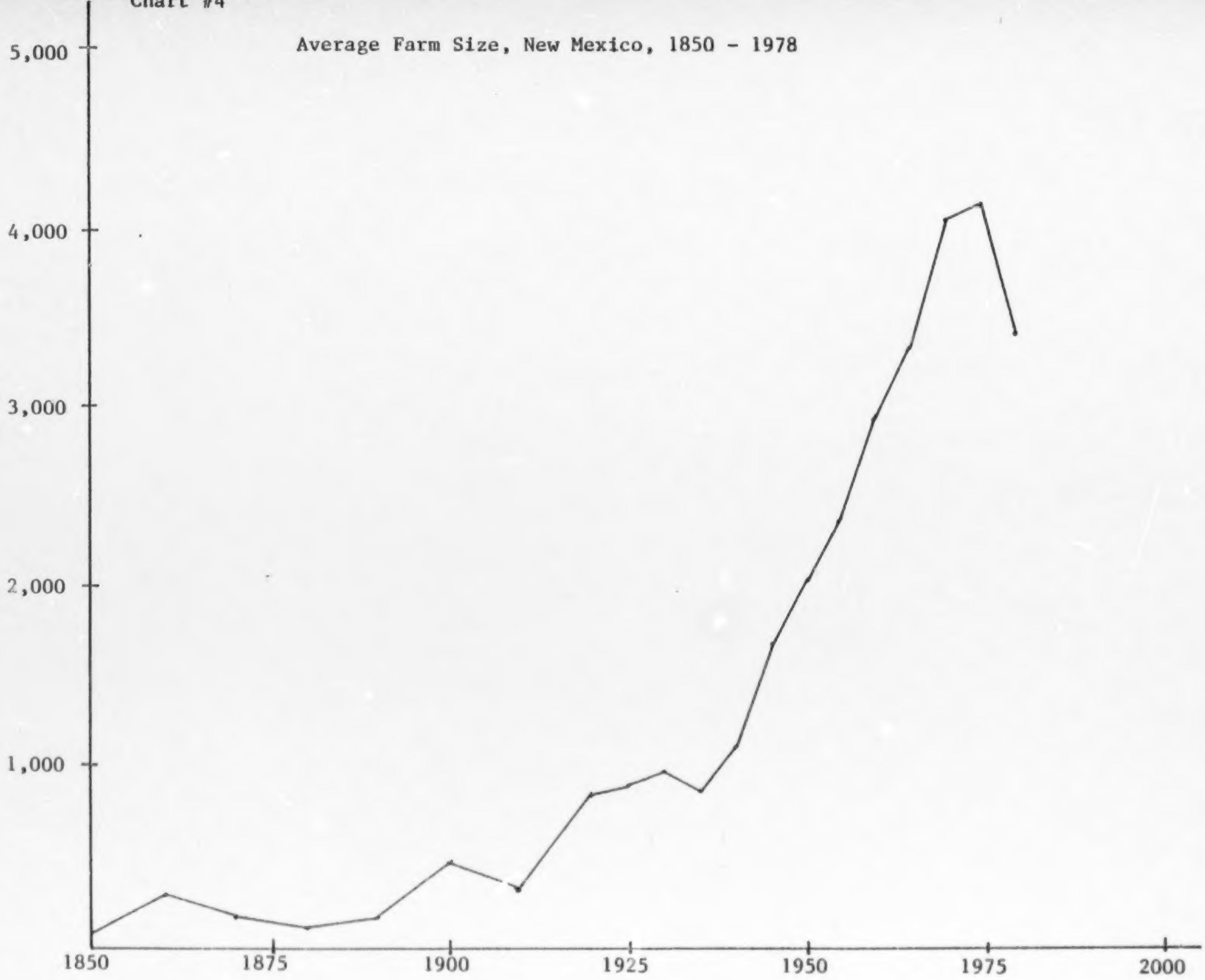
Number of Farms in New Mexico, 1931 - 1981



Sources: New Mexico Agricultural Statistics 1979, p. 18; New Mexico Agricultural Statistics 1980, p. 11.

Chart #4

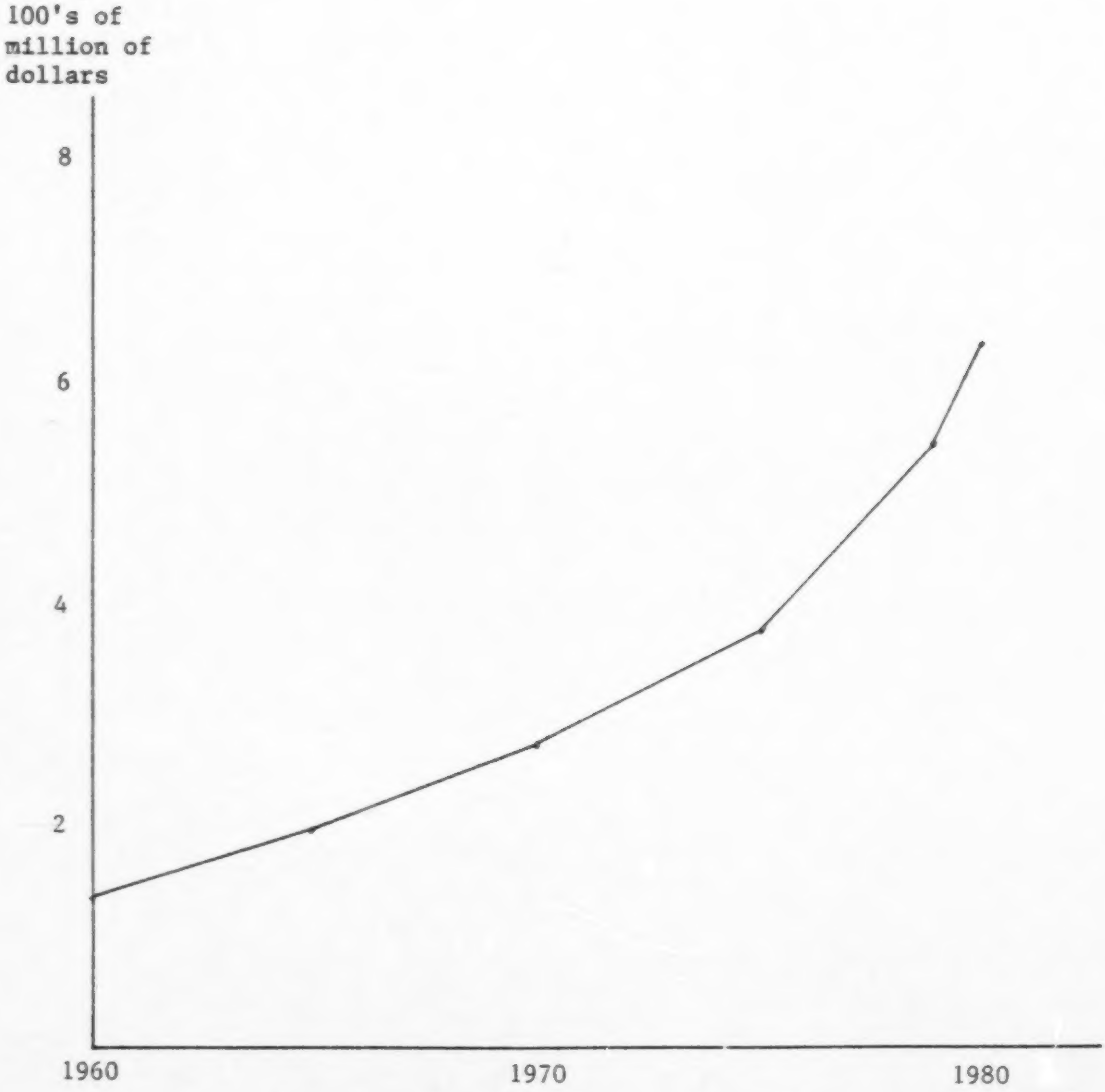
Average Farm Size, New Mexico, 1850 - 1978



Sources: Historical Abstract of the United States, Colonial Times to 1970 (Washington, D.C.: GPO,), p. 461; 1978 Census of Agriculture, p. 411.

Chart #5

New Mexico Farm Real Estate Debt
1960 - 1980



Sources: USDA, Agricultural Statistics 1980 (Washington, D.C.: GPO, 1981), p. 477.

the total farm debt in the state reached $1.19 billion,[26] an average of $87,000 for each farm in the state.

Even when farmers grow a good crop, they often cannot afford to harvest it. Although yields of 30 tons per acre for lettuce are feasible in the state, only around 10 tons of lettuce per acre is what the farmer actually harvests because he cannot afford to have the rest of the produce picked.[27] Meanwhile, the farmworkers who pick the lettuce received an average work-wage in 1980 of only $2.95 an hour, hardly a "comfortable" living.[28]

Javier Vargas, the Doña Ana County Agricultural Extension Agent, expresses well the connection between the economic problems of farmers and farmland loss in saying that in the Mesilla Valley, houses had become the farmer's best crop.[29]

Soil Erosion

Loss of topsoil, although less obvious than loss of farmland, is nonetheless a severe problem in New Mexico. The state's rangeland loses 8.3 tons of soil from every acre each year, the second worst rate in the country.[30] Cropland loses 13.34 tons per acre every year, the fourth highest rate in the country.[31] Agriculture is not sustainable with erosion rates this high; the U.S. Department of Agriculture (USDA) estimates soil erosion must be below 1 to 5 tons per acre per year to maintain soil productivity.[32] It take 300 to 2,000 years for nature to form an inch of New Mecixo's cropland soils; these soils are currently being eroded at rates of one inch every 13 years.[33]

To put New Mexico's erosion problem into perspective, think about these two facts. For every pound of wheat that is grown in New Mexico, four pounds of soil are eroded.[34] And if all the eroded soil from nonfederal agricultural lands was piled inside the city limits of Santa Fe, the town would be buried by nearly 10 feet of topsoil every year.[35]

These excessive rates of soil erosion continue despite our efforts to control them. In fact, the nationwide loss of soil per acre to wind and water action is worse today than it was during the Dust Bowl years of the 1930's.[36] As an editorial in Crops and Soils stated, "technology has...masked today's erosion problem" often with energy-intensive inputs such as fertilizers, pesticides and irrigation.[37] These inputs have allowed us to harvest larger and larger yields from a diminishing soil base.

The cost of these inputs is already high and growing astronomically. One estimate states that for every acre-foot of soil eroded, 8,000 pounds of nitrogen and 2,000 pounds of phosphorus (as well as 2 inches of water storage) are lost.[38] This would mean that New Mexico is losing 64,600 tons of nitrogen and 16,150 tons of phosphorus from its crop and pasture lands annually.[39] The cost of commercial fertilizers to replace these two primary nutrients would be $55 million.[40] Also, an equivalent of 900 acres could be irrigated with this loss of water storage capability.[41]

A more direct cost of soil erosion is sedimentation. Currently the U.S. Bureau of Reclamation is working on a proposal to replace Lake McMillan on the Pecos River with a new dam. A major reason behind the Brantly Project is that at least 63 percent of McMillan's original storage capacity is now filled in with eroded silt.[42] Brantly would cost $221 million and innundate 2,300 acres of irrigated cropland with its pool.[43] Other reserviors face similar situations: silt has already filled 36 percent of Lake Sumner, 20 percent of Elephant Butte, and 17 percent of Conchas Lake.[44]

Irrigation

Perhaps a still larger threat to New Mexico's agriculture involves the problems of irrigation. In 1975, irrigated agriculture accounted for

82.5 percent of all water withdrawals and 85 percent of total water consumption in the state.[45] Irrigation also uses an estimated 78.5 percent of the total energy New Mexico agriculture consumes.[46] Withdrawals from surface and groundwater supplies were split nearly equally.[47] Irrigation with surface waters has been practiced for hundreds of years, but the exploitation of groundwater is a fairly recent practice that now accounts for 60 percent of all irrigated land.[48]

Curry County exemplifies this trend. In 1940, Curry County had no irrigated land, yet by 1980, 222,080 acres had been developed, all irrigated with groundwater.[49] Unfortunately, this groundwater is being pumped out of the ground faster than it is being replaced, and in 20 to 40 years, Curry County will be without irrigated land once again.[50] In 1980, less than 70 percent of Curry's irrigated land was planted: nearly 70,000 acres were left idle or "fallowed".[51] In fact, any place in the state where groundwater development takes place away from major rivers can be considered the mining of a limited resource that will eventually dry up.[52]

An increase in energy prices could accelerate the decline in groundwater irrigation: the cost of energy to run the pumps could become prohibitively expensive. When natural gas prices jumped in 1973, agriculture in Pecos, Texas came to an abrupt halt: twelve of fifteen cotton gins and nearly a thousand farmers went out of business.[53] A similar jump in prices could occur again, especially with a decontrol of natural gas prices, and the effects would not be limited to farmers. Whole communities such as Clovis and Portales are tied to the agricultural economy, and the collapse of related industries such as farm equipment dealerships and food processors could lead to serious economic and social problems.

Threats to New Mexico's water come from out-of-state as well. El Paso, Texas has brought a lawsuit against the state in an attempt to overturn a New Mexican law prohibiting the export of New Mexican groundwater. If El Paso succeeds, then water supplies would be affected not only in Doña Ana County where El Paso hopes to drill its wells (Doña Ana leads New Mexico in crop production[54]), but also anywhere else in the state where demands for out-of-state destined groundwater exist. Coal companies would be free to use groundwater to operate slurry pipelines.

The quality of New Mexico's water also faces problems. Due to overdrafts from aquifers, saline groundwater will soon be drawn into wells in Eddy County and the Estancia and Tularosa Basins.[55] At present, salinization of irrigated cropland is seen as an inconvenience which can be contained with good practices and management. That is because New Mexican farmers still flush out the concentrated salt build-up in their soil with excess irrigation water. This practice, however, has led to widespread contamination of groundwater in shallow aquifers.[56] Salinization could become a greater problem in the future if care is not taken to decrease it.

A subtle, yet extremely important threat to New Mexico's future water supply is the loss of forestlands in the state. Between 1967 and

1977, New Mexico's nonfederal forest lands decreased 63 percent, from 9.3 million acres to 3.4 million acres.[57] Forests have long been identified as watershed sources, and their demise might have grave consequences for the state's future water supply and climate.

Fuels and Fertilizers

The threats to New Mexico's land, soil, and water are real, but they are not the only problems facing New Mexico agriculture. The current system also relies on fertilizers and fossil fuels, and the future prices and relative abundance of these inputs are uncertain.

New Mexico produces 83 percent of the country's potash production and 34 percent of its total consumption,[58] yet we consume only 1 percent of our production in-state.[59] The remaining 99 percent of this fertilizer is used in other states or exported to countries such as Japan, Brazil, and New Zealand.[60] Conservative estimates place New Mexico's potash reserves in the 40-50 year range,[61] and although the ending of potash production will have little effect on New Mexican farmers (since they use little potash), the economy in the southeastern part of the state as well as farmers in other areas will feel the effects. Two-hundred seventy-five employees of one potash producer were put out of work when the company suspended operations earlier this year.[62]

New Mexican farmers do use phosphorus -- 21,357 tons of phosphate in 1979. Domestic phosphorus supplies are being depleted faster than potash supplies.[63] Like potash, phosphorus production is centered in one area of the country. Central Florida produces 75 percent of the United States' phosphorus, yet its currently mineable reserves will be exhausted by 2010.[64] The United States may soon have to become a net importer instead of an exporter of phosphorus, resulting in increased costs and less secure supplies.

Energy and petrochemical use in agriculture is nearly synonymous; irrigation, fertilizers and pesticides account for 85 percent of the energy consumed in New Mexico agricultural production.[65] Yet under current practices, little energy conservation could be undertaken by a farmer who wished to maintain yields; a USDA study shows that even a doubling of energy prices would result in only a 5 percent reduction of total energy-use by farmers.[66] The same study also estimated that a 10 percent reduction in energy supplies "would lead to a 55 percent increase in raw commodity prices."[71] Ed Wheeler, President of the Fertilizer Institute, recently said that decontrol of natural gas prices could drive the cost of ammonia, a common nitrogen fertilizer, from $80 a ton to as high as $500 a ton.[68]

Due to the high energy demands of irrigated agriculture, New Mexico's agriculture is particularly vulnerable to shortages and rising energy costs. But the production sector is only one part of the food system. The USDA estimates 5 percent of our total retail food bill is for transportation costs.[69] This means that in 1980 we spent nearly $78 million (of our total food expenditure of $1.56 billion) on transportation.[70] Even though they are an inefficient mode of transportation,[71] trucks now ship most of our foodstuffs: 100 percent of all livestock, 88.2 percent of all fresh produce, and 63.8 percent of all processed food.[72] A trucker's strike or shortage of fuel would slow down or halt not only our food imports, but also the exports of cash crops upon which our current agricultural economy depends.

Trucks are far more destructive to our highways than most people realize. A report by the U.S. Comptroller General claims that one 80,000 pound truck does the same damage to an interstate highway as at least 9,600 cars.[73] Each *week*, New Mexico's highways are subject to over 700 trucks bringing food into the state, 378 trucks exporting food out of the state, and 697 trucks hauling cattle and calves in and out of the state. This total of 1,687 trucks rolling down New Mexico's highways does not include thousands of trucks hauling food from California and Arizona to the rest of the country.[74]

WHAT DO THESE FACTS MEAN?

Current trends in New Mexico's agriculture paint a bleak picture for future in-state food production, and a decrease in food production means that in the future we will increase our food imports from other states. Although this system gives us a year-round availability of many types of food, the dependence on out-of-state events and food sources it creates has two main disadvantages: 1) our food supply is insecure and particularly vulnerable to disruption; and 2) our local economy is weakened.

Vulnerability: Our food supply-line can be cut. During the fuel shortage in 1979, some food distributors came within a day or two of not having enough fuel to deliver food; in some parts of the country, a food shortage was only days away.[75] Energy shortages, however, are not the only threat to our supply of food. Other events could slow down or cut off our food pipeline: strikes by truckers, pickers, or other food industry employees, natural disasters such as insect infestations or weather-related phenomena, and political events. In July 1981, the Mediterranean Fruit Fly nearly caused a quarantine of California produce, and in the following winter, the "White Fly" wreaked havoc in the state's lettuce fields.[76] Fortunately, the effects of these infestations were minimal, but this does not rule out the possibility of a new kind of pest or blight causing the same or a more severe problem another year.

California currently supplies the country with 40 percent of the fresh fruits and vegetables and 25 percent of all table food consumed,[77] yet the state's ability to export such vast quantities of food in the future is in question. A University of California study foresees a change in the state's agricultural production in noting that: "California's enviable position in agricultural productivity has been built upon relatively inexpensive energy inputs and available supplies," and that "...most of California's best farmland lies within counties designated as Standard Metropolitan Statistical Areas."[78] The 'California connection' may be a less dependable food source than we think, and certainly one we should count on less in the future.

Weak Economy: In 1980, New Mexico had a food import/export deficit of over $450 million.[79] Importing so much food depresses our economy in terms of both dollars and jobs. Higher food prices due to escalating transportation costs are felt every time we pass through the check-out stand at the food store. Increasing local food production would not only decrease transportation costs, it would also create local jobs in the growing, processing, distributing, and marketing aspects of the food system. For every dollar collected in farm income, an additional \$2.20 is generated in the regional economy.[80] Producing more of our food locally would enhance our local economy.

WHAT CAN WE DO?

The facts about New Mexico's food system are alarming, but the situation is not hopeless. One of the main factors behind New Mexico's various food problems is a lack of clear-cut, long term planning and goals. If such planning and goals were developed, there would be many things that New Mexicans -- farmers, consumers, business people, educators, researchers, and government officials -- could do to create a food system that would best serve their needs. We believe such a food system should be productive, dependable, sustainable, safe, efficient, equitable and self-reliant.

A productive New Mexico food system would give every person in the state access to adequate food -- adequate in quantity, quality, and degree of choice. A dependable system would provide all New Mexicans with a reliable food supply, free from economic, political, or environmental disruption. A sustainable system would insure that cultural, economic, and environmental conditions of food production, processing, and distribution would permit the food system to be productive indefinitely despite possible changes in climate, availability of resources, and other factors. Safe food means the food system should not harm workers, consumers, or the environment. An efficient system would make the most appropriate use of energy, water, soil nutrients, labor, and other resources. An equitable system should generate sufficient income for the rural sector to provide a standard of living equivalent to that of other sectors of the economy and to maintain vigorous rural communities while enabling farmers to fulfill their land stewardship responsibilities.

The final term, self-reliant, should not be confused with self-sufficient; we are not necessarily saying that New Mexico should produce all of its own food. Many popular food items we consume, such as oranges, bananas, coffee, tea and cocoa, cannot be grown in the state. This does not mean self-reliance should not be examined. Increased self-reliance should be a goal, because it would bring us less costly and higher quality food, a stronger local economy, and a food sytem which would be better prepared for a decrease or cutoff of the food and other resources we currently import from other states.

In order for New Mexico to increase its self-reliance, we need to start producing more of the food we eat. In 1980, New Mexican farmers had 1,084,060 acres of irrigated cropland and 658,510 acres of dry cropland in production (of a total cropland base of 2.5 million acres).[81] At the same time, it appears that 363,000 irrigated and 1,737,394 dry acres of cropland could supply us with 100 percent of our consumption of those foods that it is climatically feasible to produce in the state.[82] Yet despite our ability to grow most of what we eat, the trend in New Mexican agriculture is to produce export-oriented items: cotton, chile, pecans, lettuce and onions (which both enter nationwide markets), and beef. Export products, however, are subject to price and demand fluctuations, and they increase our dependence on other states and countries. New Mexican farmers and ranchers could do much to alleviate this dependence by producing more foods New Mexican consumers desire.

Due to our vast amounts of rangeland, the New Mexico beef industry can produce enough beef for in-state consumption, and still provide enough for export. But the industry has had its share of problems in recent years. Nationwide per capita consumption of beef dropped 19 percent from 1976 to 1980, from 94.4 lbs. to 76.5 lbs.[83] Over the same time period, the average beef price increased over 56 percent.[84] To our ranchers' chagrin, beef is being passed up by consumers because they see it as full of expensive fat.[85] One solution to change this lack of demand is for ranchers to give the consumers what they want: lean beef.[86]

New Mexico is particularly well suited for raising leaner beef. Due to our relatively mild climate, open range is available throughout the year.[87] Ranchers can save money and energy by using native grasses instead of grain to put weight on their stock.[88] Leaner beef would not only give consumers what they want, but it would also free up large amounts of cropland currently producing feed grains. This land could be put to use growing more food for direct human consumption.

Changes in the USDA beef grading standards could help accelerate the move to leaner beef, yet they aren't a necessary first step. New Mexican ranchers can reach out to new markets on their own and with the help of the New Mexico Beef Council. Direct marketing to consumers and restaurants is a good place to start.

We could immediately increase our production of vegetables. Currently we import 53 percent of the fresh vegetables we consume from as far away as California, Illinois, and Florida. It would require 29,000 acres of irrigated cropland to grow all of the fresh vegetables consumed in-state, while less than 45,000 acres would be needed to produce all our fresh and processed vegetables.[89] Vegetables are a valuable cash crop, and New Mexico's climate allows them to be grown "as good as anywhere else."[90]

Vegetables are well suited to various direct marketing methods; farmers' markets and pick-your-own establishments are two such methods. A USDA study in Colorado has found that both farmers and consumers benefit from direct marketing: farmers received returns 44 percent higher than they would through wholesale channels, and consumers paid 28 percent less than supermarket prices.[91]

Currently, seven farmers' markets operate in New Mexico.[92] This could be greatly expanded. Albuquerque's market is open only twice weekly, at only one location and the future of its location is in question due to the city's plans to build a mall at its present site.[93] Incorporating the present farmers' market into the planned mall, as well as setting up locations in other parts of the city would help both farmers and consumers. Other possibilities for founding new markets and expanding existing ones should be explored.

Another market for farmers is within the current system of wholesalers and grocery stores. Although breaking into the chain grocery stores can be very difficult, at least one wholesaler in the state is looking for more local produce in order to decrease imports from California.[94] Developing cooperatives to sell produce (as well as other foodstuffs) to grocery stores, restaurants, and institutions should be utilized by growers to sell their production. In-store signs identifying locally grown foods could encourage consumers to buy local foods.

In the end, much of the burden to increase local production falls onto the consumer; a farmer won't grow a crop unless he can sell it. As New Mexico consumers, we must start consuming more New Mexico produced foods. Contacts with farmers should be developed, and bulk purchases of in-season foodstuffs for preserving should be undertaken. Also, minor seasonal changes in diet could increase consumption of local foods. By substituting locally-grown cold-storage vegetables (such as carrots, potatoes, cabbage and winter squash) for imported vegetables (such as tomatoes, lettuce, and celery) during the winter months, we would reduce our reliance on California vegetables and help our own farmers and economy. (Chart #6).

Consumers can increase their self reliance, and save money doing so. Home gardens can provide a wide variety of fresh vegetables at a very low cost. In 1980, 23 percent of the households in the Far West had vegetable gardens.[95] Each garden yielded an average of 588 pounds of vegetables, worth $460.[96] Since the cost of a garden is low -- $19 for seeds, tools, fertilizers, and pesticides -- the gardener "makes a profit" of $441 in fresh vegetables, and has the added benefits of a little exercise and relaxation.[97] If half of all New Mexican households had vegetable gardens, over 60 percent of the state's fresh vegetable consumption could be met.[98] This is not an unrealistic figure, for it is estimated that 33 percent of New Mexico area households would like to have gardens, but don't have access to land.[99]

For those hesitant to start gardening, the New Mexico State University Cooperative Extension Service has published a guide to help gardeners, identifying over 40 vegetables which can be grown in the state.[100] Alternative methods of food production, such as solar grow frames, greenhouses and indoor sun rooms, are initially more expensive than conventional gardens, but they pay for themselves by producing fresh vegetables throughout the year.

In addition to producing more of what we consume, we could strengthen our food system by increasing our self-reliance of nitrogen and phosphorus fertilizers. If we made use of the nitrogen and phosphorus in economically collectable livestock and poultry manure in the state, we could produce 26.5 percent of the nitrogen and 52 percent of the phpsphorus consumed in-state.[101] A bonus is that animal and human wastes can be used for methane gas production before being applied to fields.

The Navajo Indian Tribe should reevaluate the direction in which the Navajo Indian Irrigation Project (NIIP) is headed. Originally planned to encourage small farmers, the project was later placed in the hands of a corporation specializing in international agricultural systems such as plantations.[102] NIIP now has 45,000 acres under irrigation with plans to expand to 110,000 acres,[103] this expansion representing the remaining undeveloped surface water rights in the state.[104]

NIIP characterizes the import/export syndrome of New Mexican agriculture. While San Juan Valley residents must import foodstuffs like the rest of us, NIIP has geared its production to exports. The project distributes its output, mainly pinto beans and alfalfa, to other western states, as well as Mexico and Japan.[105] If NIIP were to diversify the production and develop local markets, they could supply much of the local demands and still have vast surpluses for regional exports.

Farmers and consumers can make changes on their own to increase our self-reliance. However, we still face a difficult task in finding solutions to the problems preventing us from obtaining a sustainable, dependable, and safe food system: preserving farmland, conserving water and soil, and developing new crops, markets and methods in farming are major objectives in achieving this. Farmers are too strapped financially to worry 10 to 20 years down the road; they must survive from year to year. Consumers, likewise often have little control over how our food system works. Consumers and farmers can, however, work with the government to build a stronger food system. An active role by the New Mexico State Government is needed if we hope to develop a food system with long-term viability. Fortunately, the government is financially secure enough to do this. Fiscal year 1979-1980 saw the state produce a $139.7 million surplus.[106] Also, the more than $1.4 billion in New Mexico's Permanent Fund and Severence Tax Permanent Fund could grow to over $9 billion by the turn of the century.[107]

New Mexico's financial status is good due to the state severence taxes on petroleum and mineral resource production. It is uncertain, however, it the state's tax rates are in line with other states' rates; Montana's severence tax on coal is 3 times that of New Mexico's, yet New Mexico's tax has recently been reduced.[108] Unlike New Mexico, Canada has a windfall profits tax on potash, while New Mexico copper, potash, and molybdenum producers all receive substantial tax breaks.[109] Also, most of these natural resources are consumed out-of-state; only 37 percent of the New Mexico coal-generated electricity remains in New Mexico.[110]

New Mexico could increase taxes on production of our state's non-renewable resources, particularly those exported. Just as the water in the Ogallala Aquifer is disappearing, so will our reserves of oil, natural gas, copper, potash, molybdenum, coal, and uranium. Currently the economic effects from the collapse of the oil and gas industry alone are far more worrisome to economists than the drying up of the East Plains.[111] The revenue from taxes on these depletable resources (as well as a portion of the current surpluses and money stored in banks as permanent funds) could finance the construction of a sustainable economy for New Mexico, one based on renewable resources. One foundation of such an economy is agriculture. To this end, the state govenment has a necessary role to play.

RECOMMENDATIONS FOR CHANGE

There are many different ways for New Mexico to achieve a more sustainable and self-reliant agricultural base and food system. It is not feasible in this report to examine all of our possible options, so we will focus on three: 1) an overall survey of needed state initiatives, 2) an emergency state plan for feeding New Mexicans, and 3) actions for New Mexican consumers to take for firmer control of their food supply.

1. Recommended State Initiatives:

A. Preservation of Cropland

Remaining cropland, especially prime farmland, must be protected from non-agricultural uses. New Mexico has one law that attempts this by assessing farmers on the basis of the agricultural value of their land, rather than the market value (development value). However, this land-use tax often has an opposite effect: investors can purchase farmland as a tax shelter. Although it is a start, the land-use tax alone will not succeed in protecting New Mexico's farmlands.

There are numerous ways to preserve farmland: agricultural zoning, easing of inheritance taxes, establishing a development permit system, assessing large enough capital gains taxes to deter land sales and speculation, creation of "agricultural open space" preserves or districts, or, as the French have done, grant the state "first refusal" rights on farmland being sold. The need to fit a particular method with each set of demands prohibits any generalization as to which formula would work best in New Mexico.

The USDA Soil Conservation Service has made Prime Farmland Inventories of seven counties in the state,[112] and currently is involved in a complete mapping project of prime farmland.[113] These maps should be used by community and state planners to protect prime agricultural areas from development and speculation.

One innovative proposal to protect farmland, developed by Joel Diemer, an agricultural economist at New Mexico State University (NMSU), would involve the exchange of cropland development rights for public land. The Lower Rio Grande Valley presents a problem of controlling cropland development unique to parts of the western United States. Privately owned land is limited to a narrow strip of land along the Rio Grande's floodplain, land that has historically been irrigated cropland. Meanwhile, the creosote-covered mesas overlooking the floodplain are federal land, and since this federal land is closed to development, cropland is converted to urban uses as Las Cruces and other valley communities grow.

B. Soil Conservation

A combination of incentives and disincentives might be needed to control erosion. A first step would be for New Mexico to adopt a soil conservation law similar to New York's, which requires a conservation plan for all agricultural lands over 25 acres. At the same time, the state should increase financial help for programs which encourage soil conservation and land management practices. This would include tax-breaks for capital investments made by farmers adopting practices such as strip cropping (intertillage), contour tillage, minimum and zero tillage, and increased use of crop rotation, shelter belts, and cover crops.

The USDA has determined that practicing minimum tillage techniques on 80 percent of all U.S. cropland alone would reduce cropland soil erosion by 50 percent or more.[116] Perhaps limiting the use of the moldboard plow would do more for controlling cropland erosion than any other single step. Minimum tillage also helps farmers with dry cropland because it increases the soil's water storage capacity, as well as allowing deeper root penetration.[117] Control of rangeland erosion requires better management of livestock. At present, poor management threatens 74 percent of our non-federal rangelands.[118]

C. Water Conservation

New Mexico's life blood is its water, and the state needs to develop long-range plans for using and conserving our limited water resources.

The cost of water for all users should be accurately priced. The elimination of block-rate structures (whereby the largest user of water is charged the lowest rate) would help decrease consumption. The state should also provide funds for setting up irrigation scheduling programs, and investment incentives for the adoption of drip irrigation and other water conservation equipment and programs. State-run programs should be extended to include urban consumption of water as well. Although agriculture is the largest user of water in the state, increased growth in urban areas will threaten both the quality and quantity of agricultural water supplies.

D. Production and Marketing

Greater emphasis needs to be placed on diversifying and increasinng farm production in New Mexico. Likewise, in-state markets must be developed. New Mexicans Ben Mason and Tom Clevenger have identified San Juan County and the Middle and Upper Rio Grande Valleys as lacking the infrastructure necessary to achieve their agricultural potential. Mason and Clevenger believe that the state has the responsibility to act as a matchmaker between growers, credit associations, machine operators and consumers.[119] In this role, the state could also encourage production of locally-consumed foodstuffs. A similar option is to adopt a program like the Small Farm Management Assistance Program being tried in New England. Funded by the USDA and church groups, one of the program's tasks is to help small farmers find markets.[120]

Farmers' markets, roadside stands, and "pick-your-own" outlets all play a role in distributing local, fresh food, and the state can do more to encourage their number and use. Purchase of local foods by institutions such as schools, universities, prisons, senior-citizen centers, day-care centers, hospitals, and military establishments is recommended. In fact, state institutions in Maine are required by law to give preferential treatment to in-state food producers.[121]

A plan to encourage supermarkets to purchase and sell regionally produced food must be a priority if local foods are to compete with imports. Education is a key here: supermarket buyers and consumers alike need to learn that purchasing local products helps the local economy while it decreases the vulnerability of our food supply.

Consumer cooperatives, restaurants, and food processors must also be encouraged to buy more local foods. The state could help establish food processing and storage facilities to supply and distribute products on a year-round basis. These centers could grade, pack, and distribute the output of small local producers and provide large buyers with the volumes and specifications they demand.[122] Such centers could also help bring in foodstuffs from outlying parts of the state to the highly populated areas. Foodbanks are another viable alternative for storing and distributing food to those who would otherwise be unable to obtain enough food.

Electronic markets, based on telephone hook-ups to a central computer, could alleviate the problem of large distances which separate producers from wholesalers and consumers in the state. Since potential buyers throughout the state could tie into the system, competitive prices would be offered to the growers. Electronic markets could also be used for advance contracting, thus insuring growers a market for their production before planting. The state could develop such a marketing system, perhaps locating the initial hook-ups at county extension offices until on-farm diffusion took place.

Tax incentives can be used to promote production and widen the marketing options in New Mexico. An example is one which would exempt from taxes the first $10,000 worth of food produced for local consumption. Tax incentives to attract food processors to the state would decrease transportation costs for processed food and develop new jobs in a clean industry.

E. Research

Research is often needed before farmers can adopt new farming methods or grow new crops. This is a role for New Mexico's land grant university to take. Continuing research needs to be undertaken in water conservation practices and developing crops which use less water. Work with water harvesting should continue to be explored as well, with experimentation on a variety of catchment area systems. Research on irrigation systems can also be expanded.

As the East Plains moves towards more dry cropland farming, the need for more drought-tolerant crops will increase. There are many crops suitable for dryland agriculture: jerusalem artichoke, amaranth, pearl millet, marginal land oilseeds such as the native buffalo gourd, and quinoa can all produce foodstuffs. Other plants such as guayule, jojoba, and gopher plant could become viable alternatives to many petroleum-based products.

Research on renewable energy resources, as well as continued state support for their adoption, is also necessary. Work is already being conducted on alcohol production and solar energy. In fact, one application of solar technology is approaching economic feasibility: photovoltaic-generated electricity may soon be used to fill stocktanks with water in locations with light summer winds.[123]

One branch of renewable energy with great possibilities is the conversion of animal, human, and other wastes to a usable gas. There is a dairy in New York that will be producing 65 to 75 percent of the energy required to run the farm by producing methane gas from manure, and a liquid fuel from corn or sunflower seed.[124] More work should be done in New Mexico with such on-farm energy alternatives.

Aquaculture research has a place in New Mexico as well. Researchers have found that over a few years, saline land can be converted to good cropland with aquaculture. The approach uses shallow ponds in fields to flush out the salts concentrated in the upper levels of the soil.[125] Also, raising fish in a system coupled with poultry or livestock production has been successful in many parts of the world.[126] Aquaculture for small-scale or home producers should also be investigated, especially in connection with greenhouses.

Effects of energy development of agriculture also need to be monitored. A New Mexico State University study found that although 1976 levels of sulfur dioxide in the Four Corners region probably did not reduce crop yields, an increase in coal-burning industries, such as coal gasification plants or more power plants could change this.[127] The break of the Church Rock tailings pond which released 96 million gallons of radioactive wastes into the West Rio Puerco also illustrates the need to watch very carefully the uranium industry's effect on our land and water.[128]

Research need not be limited to scientists and other specialists. We all can play a role in exploring new ways to build a more self-reliant and sustainable food system. Discovering the history of the food we eat is a good place to start. Graduate students, under Paul Lusk at the University of New Mexico School of Architecture and Planning, have undertaken studies in examining the urban/rural relationships in the state as well as farmland preservation. Home gardeners can continue to grow those heirloom or locally popular varieties of fruits and vegetables which grow especially well in New Mexico's climate and soils.

F. Create a Department of Food and Agriculture

New Mexico's Department of Agriculture is currently a regulatory agency. Legislation should be enacted to expand the department's involvement in the state's food system. In addition to insuring food safety and quality, the department could serve as the center for coordinating a regional food system. It could also be the prime advocate for New Mexican farmers and ranchers. Other duties the department should undertake would be to:

1. Maintain the resource base of New Mexican agriculture, including farms and farmlands.
2. Determine which imported foods could be produced locally.
3. Expand local markets.
4. Develop a clearinghouse for food-related research going on in the state (as well as in other states).
5. Promote a program to educate consumers about nutrition and how they can play a more active role in their food system.
6. Encourage through advertising campaigns the identification and promotion of New Mexico food products (Massachusetts and Pennsylvania are among the states that already developed such a program).
7. Develop a long-range food plan to regionalize our food supply.
8. Be in charge of developing an emergency state food plan.

2. Emergency State Food Plan

An emergency food plan is a form of insurance for all New Mexicans, in the event we are faced with problems beyond the state's control. An emergency state food plan for New Mexico needs to incorporate measures which will deal with contingencies such as: a complete cutoff of oil from all OPEC countries to the United States; a multi-year drought or insect infestation in our food producing areas; a near shutdown of one to four weeks of the U.S. trucking and rail system; a widespread labor dispute in New Mexico's present day food producing areas;

and an extraordinary leap in food prices so that only the wealthiest people could afford to buy food.

Some options New Mexico has for dealing with these contingencies include establishing state or regional food storage facilities, encouraging home, community, and city storage of basic foodstuffs, forming within our current Civil Defense organization state-wide communication and coordination centers for dealing with a food emergency, and the general encouragement, expressed in all these measures, of producing more of our food within New Mexico.

3. New Mexico Consumer Activities

There are numerous options available to New Mexico consumers in helping to promote a stronger and healthier food system. First of all, we must increase our awareness of how the food system operates and where our food comes from. Currently, 25 percent of all fruits and vegetables are lost through spoilage between harvest and time of purchase.[129] Nutritive losses occur as well. By purchasing more locally-grown foodstuffs, we can decrease waste, increase nutritional value, and support our local farmers and economy. Consuming more fresh foods would also save energy; twice as much energy is used in processing our food than growing it.[130] By developing a more prudent diet, consumers can lead a healthier life. In the United States most of the health problems found to be leading causes of death are diet-related diseases.[131] A healthier diet would include less fat, salt, sugar and cholesterol while including more fiber and vegetable protein.

As New Mexico consumers, we can also begin to be responsible for producing more of our own food at home. Vegetable gardens and fruit trees need to be planted. Preserving food, at home or community canneries or warehouses, would help decrease food costs. Solar drying of food is well suited to New Mexico. Also, solar grow frames, greenhouses, and sun-spaces in houses can help extend the growing season. Small-scale fish, rabbit, and chicken production can fit into many existing houses, and with a bit more land, a few hogs, sheep, goats, or cattle can be kept. It is time for the New Mexican consumers to take more responsibility for their food system. These recommendations show a place to start.

CONCLUSION

At first glance, the problems might seem insurmountable, and the goals unachievable. Our food and agriculture system is ailing, and without changes, will continue to decline until the situation becomes critical. However, there are solutions. To start working toward these solutions requires a healthy dose of optimism, and the belief that change can begin with the individual.

Implementing even a few of the suggestions mentioned above can help strengthen New Mexico's food security and economic well being, while providing consumers with more nutritious and better tasting food. These changes would also decrease our vulnerability to situations beyond our control. As farmers, consumers, and business people, church and civic groups, universities and colleges, and town, city, county and state government agencies, all New Mexicans have within their reach the means to take control of and strengthen their food and agriculture system.

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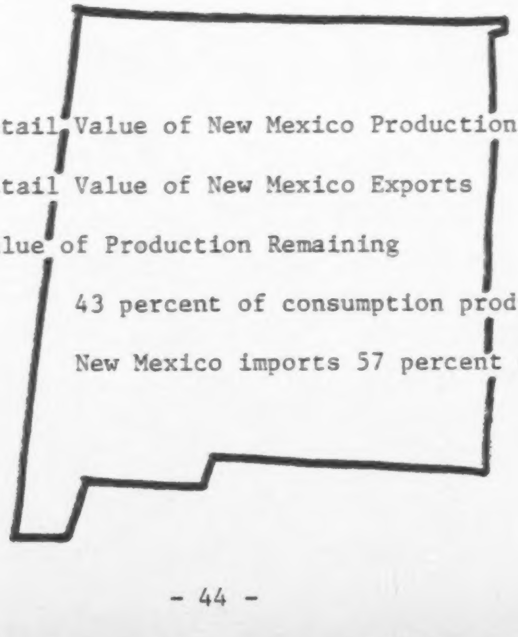
APPENDIX

New Mexico's agricultural heritage extends back four hundred years to the agrarian culture of the Pueblo Indians. Today, New Mexico produces crops of national and international importance, including pecans, peanuts, lettuce, and onions. New Mexico leads the nation in the production of chile peppers. With 1980 cash receipts from farm marketings totaling over one billion dollars, the New Mexico food and agriculture system appears to be flourishing. Despite these successes, 57 percent of the food consumed by New Mexicans is imported from other states. Each year New Mexicans spend nearly $78 million on transportation costs for food imported from as far away as Florida, Michigan, and Oregon.

Producing more of our own food would not only reduce these transportation costs, but would also create jobs for New Mexicans in food production, processing , and wholesale and retail sales. Locally produced food would provide consumers with fresher, more nutritious fruits, vegetables, and meats. Farmers and ranchers, consumers, researchers, businesses, and state and local govenments need to work together to make our food system sustainable. Farmers' markets and central food storage facilities need to be built. Residential and agricultural water use should be carefully monitered and assessed in order to conserve this precious resource. Marketing programs are needed to encourage consumers to buy locally produced fruits, vegetables, and range-fed meats. These are just a few of the steps that will lead New Mexicans to a sustainable, productive, efficient, safe food and agricultural system.



Retail Value of New Mexico Production	$ 1,097,020,900
Retail Value of New Mexico Exports	422,901,700
Value of Production Remaining	$ 674,119,200

43 percent of consumption produced in New Mexico

New Mexico imports 57 percent of its food

NEW MEXICO FOOD IMPORTS

COMMODITY	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
	Retail Weight[a] (1,000 lbs.)	Retail Value[b] (1,000 lbs.) (1980 dollars)	Retail Weight[c] ($1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of NM Consumption[d]
Meats									
Beef	187,077.5	435,142.3	99,450.0	231,320.7			46.8	203,821.6	616,507.1[e,+]
Veal	0	0	1,950.0	5,986.5	100.0	5,986.5		f	710.4[g]
Lamb & Mutton	4,771.6	14,018.9	1,690.0	4,965.2			64.6	9,053.7	418,697.3[h,*]
Pork	6,404.4	9,235.2	88,790.0	128,035.2	92.8	118,799.9			
Poultry									
Chickens	1.6	1.8	65,000.0	71,825.0	99.99	64,998.2			123,809.5[i,*]
Turkeys	39.9	35.9	13,650.0	12,298.7	99.7	12,262.6			42,250.0[*]
Eggs	47,971.4	22,213.5	44,980.0	20,828.3			6.23	1,384.2	92,973.3[*]
Dairy									
Fluid Milk & Cream	472,187.0[j]	435,356.5	325,000.0	299,650.0			31.2	135,706.5	198,975.3[k,+]
Butter	ND[l]		5,720.0	10,353.2					53,159.5[+]
Cheese	0[m]	0	22,880.0	51,124.9	100.0	51,124.9			73,938.6[+]
Cottage Cheese	8,240.0	7,127.3	5,850.0	5,060.0			29.0	2,067.3	2,840.5[+]
Dry Milk Products	0	0	8,840.0	14,527.9	100.0	14,527.9			9,538.8[+]
Evaporated & Condensed Milk Products	0	0	9,230.0	4,810.6	100.0	4,810.6			8,558.5[+]
Frozen Milk Products	20,101.5	35,559.6	34,190.0	60,482.1	41.0	24,922.6			36,181.3[+]
Fish									
Fresh, Frozen & Canned	NC[n]		16,120.0	30,446.8	100.0	30,446.8			697.8[o]

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NEW MEXICO FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight[a] (1,000 lbs.)	CONSUMPTION Retail Value[b] ($1,000) (1980 dollars)	Retail Weight[c] (1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	IMPORTS % Import	Retail Value of Import ($1,000)	EXPORTS % Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of NM Consumption[d]
Vegetables, Fresh									
Artichokes, Globe	NA[p]		390.0	215.2	100.0	215.2			NA
Asparagus	56.8	97.0	390.0	666.3	85.44	569.3			178.6
Beans, Snap	373.9	299.9	1,690.0	1,355.4	77.9	1,055.5			528.8
Broccoli	9.2	9.0	2,210.0	2,170.4	99.6	2,161.4			480.4
Cabbage	877.0	290.3	10,920.0	3,614.5	92.0	3,324.2			510.5
Carrots	74.7	19.2	7,930.0	2,038.0	99.1	2,018.8			636.7
Cauliflower	Insignificant		1,690.0	1,812.0	100.0	1,812.0			475.4
Celery	NC		9,490.0	3,283.5					210.0
Corn, Sweet	10,809.7	4,464.4	8,580.0	3,543.5			20.0	920.9	1,092.2
Cucumbers	697.0	312.3	5,200.0	2,329.6	86.6	2,017.3			574.4
Eggplant	84.2	44.6	650.0	345.5	87.1	300.9			38.6
Escarole	NC		780.0	627.6					61.2
Garlic	31.6	78.7	1,040.0	2,598.7	97.0	2,520.1			98.8
Green Bell Peppers	11,920.1	9,691.1	4,290.0	3,487.8			64.0	6,203.3	587.0
Lettuce	59,892.0	20,243.5	3,237.0	10,941.1			46.0	9,302.4	1,907.2
Mushrooms	NC		3,510.0	6,419.8					
Onions	106,314.0	30,086.9	13,260.0	3,752.6			88.0	26,334.3	486.4
Potatoes	51,840.0	7,827.8	64,090.0	9,677.6	19.1	1,849.8			3,708.9
Spinach	5.6	10.6	910.0	1,718.1	99.4	1,707.5			324.0
Tomatoes	7,291.7	5,366.8	14,820.0	10,907.5	50.8	5,540.8			1,660.5
Minor Vegetables (Limas, Beets, Kale, Green Peas)	NC		13,260.0	8,231.1					
Sweet Potatoes	4,737.9	2,518.7	4,420.0	2,249.6			6.7	169.0	414.2
Dry Field Peas	148.2	194.8	520.0	332.7	71.5	237.8			361.4
Dry Edible Beans	2,789.2	1,037.9	8,450.0	3,144.4	67.0	2,106.5			14,590.4
New Mexico Chili Peppers (dry wt)	46,800.0[q]	101,114.2	NC						

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NEW MEXICO FOOD IMPORTS

	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
COMMODITY	Retail Weight[a] (1,000 lbs.)	Retail Value[b] ($1,000) (1980 dollars)	Retail Weight[c] (1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100 % of NM Consumption[d]
Vegetables									
Canned & Frozen									
Asparagus			468.0	931.9					260.7
Beans, Lima			1,001.0	565.4					340.6
Beans, Snap			9,360.0	3,625.4					1,346.8
Beets			1,560.0	562.2					70.3
Broccoli			1,820.0	2,066.2					484.1
Brussels Sprouts			325.0	316.3					30.9
Carrots			1,859.0	1,117.9					238.9
Cauliflower			598.0	556.0					221.3
Corn			10,049.0	5,177.5					2,254.8
Onions			884.0	477.9					36.6
Peas			6,292.0	3,170.6					1,715.5
Pickles			8,970.0	7,582.4					754.9
Potatoes, frozen			21,970.0	11,995.6					3,051.4
canned			1,690.0	1,334.9					147.6
dehydrated			2,080.0	1,677.3					820.4
chips & shoestring			5,460.0	10,920.0					1,237.6
Pumpkin and Squash			520.0	284.9					55.6
Sauerkraut			1,560.0	787.1					59.5
Spinach			650.0	327.9					39.4
Sweet Potatoes			1,300.0	693.4					141.7
Tomatoes, Whole			7,930.0	2,934.1					261.8
pulp, puree			1,040.0	460.1					71.8
catsup, paste, sauce			15,730.0	10,676.6					1,241.3
Fruits, Fresh									
Apples	11,520.0	8,156.2	20,800.0	14,726.4	44.6	6,570.2			4,489.7
Apricots	199.0	236.8	130.0	154.7			34.7	82.1	45.3
Avocados	NA		1,040.0	749.6	100.0	749.6			NA
Bananas	NA		27,040.0	9,085.4	100.0	9,085.4			NA
Cantaloupe	2,086.8	918.2	8,580.0	3,775.2	75.7	2,857.0			867.5

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NEW MEXICO FOOD IMPORTS (continued)

	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
COMMODITY	Retail Weight[a] (1,000 lbs.)	Retail Value[b] ($1,000) (1980 dollars)	Retail Weight[c] (1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to Produce 100% of NM Consumption[d]
Fruits, Fresh (Cont.)									
Cherries	101.6	90.3	780.0	693.4	86.9	603.1			825.9
Citrus	NA		36,140.0	10,408.3	100.0	10,408.3			NA
Cranberries	NA		130.0	110.5	100.0	110.5			NA
Grapes	91.6	131.6	4,680.0	6,726.8	98.0	6,595.2			6,049.7
Nectarines	Insignificant		2,080.0	2,425.6	100.0	2,425.6			493.5
Peaches	406.6	264.7	7,020.0	4,570.0	94.2	4,305.3			4,266.3
Pears	1,026.1	495.6	3,120.0	1,506.9	67.1	1,011.3			848.7
Pineapples	NA		1,820.0	798.1	100.0	798.1			NA
Plums & Prunes	787.7	918.5	1,950.0	2,274.0	59.6	1,355.5			459.6
Strawberries	NC		2,210.0	1,797.4					892.4
Watermelons	1,702.8	554.2	13,390.0	4,357.6	87.3	3,803.5			1,352.5
Fruit, Processed									
Frozen Fruit (noncitrus)	NC		3,601.0	5,035.5					
Citrus Juice (frozen)	NA		12,870.0	16,306.3	100.0	16,306.3			NA
Noncitrus Canned Fruit	NC		15,730.0	12,874.6					
Dried Fruit	NC		3,822.0	12,328.2					
Citrus (Canned)	NA		1,040.0	749.6	100.0	749.6			NA
Apple Juice	NC		6,188.0	7,526.8					1,748.5
Other Noncitrus Juices	NC		10,777.0	10,261.5					
Citrus Juice (canned)	NA		17,264.0	5,973.1	100.0	5,973.1			NA
Olives	NA		1,040.0	1,649.8	100.0	1,649.8			NA
Fats and Oils									
Lard	532.1	251.7	3,250.0	1,537.3	83.6	1,285.6			r
Margarine	NC		14,560.0	11,153.0					
Shortening	NC		23,790.0	17,557.0					
Oils	NC		29,510.0	27,439.3					

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NEW MEXICO FOOD IMPORTS

	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
COMMODITY	Retail Weight[a] (1,000 lbs.)	Retail Value[b] ($1,000) (1980 dollars)	Retail Weight[c] (1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of NM Consumption[d]
Nuts									
Almonds	NA		546.0	2,487.3	100.0	2,487.3			NA
Peanuts	12,427.7	21,324.3	7,930.0	13,606.8			36.2	7,717.5	5,615.2
Pecans	5,800.0	21,906.6	468.0	1,767.6			91.9	20,138.9	1,004.1
Walnuts	Insignificant		676.0	1,939.3	100.0	1,939.3			3,140.7
Grains									
Barley Products	Insignificant[s]		1,560.0	2,350.4	100.0	2,350.4			2,636.6[*]
Corn Meal, Cereal & Hominy	NC[t]		18,070.0	7,275.4					7,258.7
Corn Syrup, Starch & Sugar	NC[t]		70,720.0	57,699.2					59,819.2
Oat Products	Insignificant		4,030.0	2,614.3	100.0	2,614.3			4,838.4[*]
Rice	NA		12,090.0	10,832.6	100.0	10,832.6			
Rye Products	Insignificant		910.0	328.0	100.0	328.0			1,035.9[*]
Wheat Products	NC[t]		155,090.0	33,366.7					249,756.4[*]
Misc.									
Coffee, Cocoa, & Tea	NA		14,560.0	80,149.7					NA
Cane Molasses	0		260.0	374.8	100.0	374.8			
Honey	416.0	587.7	1,560.0	2,203.9	73.3	1,616.2			
Sugar	72,000.0[u]		108,680.0	40,863.7	100.0	40,863.7			20,033.9
TOTALS	1,041,848.7	1,097,020.9	1,729,793.0	1,558,619.2		575,516.4		422,901.7	2,100,219.5[v]

New Mexico Food Imports Chart

Notes:

a. Farm weights for New Mexico production were from:

New Mexico Agricultural Statistics 1980 (Las Cruces: New Mexico Crop and Livestock Reporting Board, 1981).

United States Census of Agriculture 1978 (Washington, D.C.: Government Printing Office, 1981).

Livestock Slaughter Annual Summary 1980 (Washington, D.C.: USDA Crop Reporting Board, 1981).

Dairy Products Annual Summary 1980 (Washington, D.C.: USDA Crop Board, 1980).

Retail weights were calculated from farm weights using the conversion factors in Conversion Factors and Weights and Measures Statistical Bulletin No. 616 (Washington, D.C.: USDA Economics, Statistics, and Cooperatives Service, 1979).

b. Prices were obtained from U.S. Department of Labor, Bureau of Labor Statistics; Safeway Supermarkets in Sante Fe and Artesia, New Mexico.

c. Consumption in New Mexico is based on U.S. per capita consumption figures as they appear in Food Consumption, Prices, and Expenditures, Statistical Bulletin No. 672 (Washington, D.C.: GPO, 1981) and The Mushroom Institute, Kennett Square, Pennsylvania.

d. Irrigated and/or dry cropland acreage based on New Mexico, Texas, or nationwide yields from: New Mexico Agricultural Statistics 1980; U.S. Census of Agriculture 1978; Agriculture Statistics 1980 (Washington D.C.: GPO, 1981); except where otherwise noted. Cropland is assumed to be irrigated unless noted with * for dryland, or + for dryland/irrigated, combination.

e. Based on figures from Agricultural Resources Consumed in Beef Production by Willima Lockeretz (Springfield, VA: National Technical Information Service, 1975).

f. Veal is a by-product of the dairy industry, so land area would be included in dairy land requirements.

g. Acreage requirements for lamb and mutton from Raising a Small Flock of Sheep (Washington, D.C.: GPO, 1977).

h. Acreage requirements based on 16 bushels of grain sorghum per hog.

i. Acreage requirements for chicken from Poultry: Feeds and Nutrition by Philip John Schnaible (Westport: AVI Publishing Co., 1979).

j. Production of fluid milk and cream was determined by subtracting whole milk equivalent used in dairy products from total milk production, and converted using a USDA conversion factor.

k. All dairy land requirements take into account replacement stock. They are based on feed estimates by Mr. Borden Ells, Dairy Specialist, New Mexico State University. No attempt has been made to take into account by-products of dairy goods.

l. ND - Not Disclosed. Butter is produced in New Mexico, but the New Mexico Crop and Livestock Reporting Service does not disclose the quantity.

m. Cheese, dry, evaporated, and condensed milk products are not commercially produced in New Mexico. (NM Crop and Livestock Reporting Service).

n. NC - Not Collected.

o. Extrapolated from yields of 100 lbs. of fish from 1/385th of an acre in an intensive recirculating fish culture unit. Steve Van Gorder, Rodale Research Center, Maxatawny, PA.

p. NA - Not Applicable.

q. Although Chile peppers are a major crop in New Mexico, production is not included in total production figures because consumption data is unavailable.

r. Lard is a by-product of hog slaughter, so land area would be included in pork land requirements.

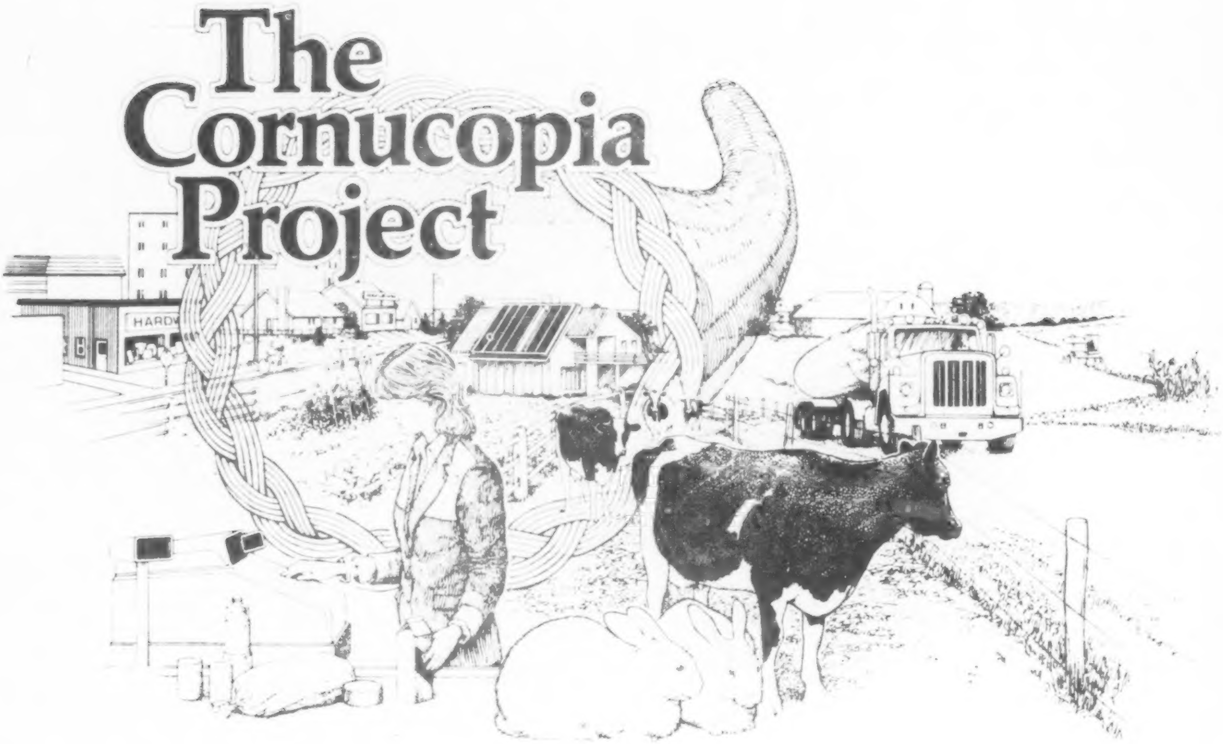
s. Barley, oats, and rye are produced in-state, but not for human consumption. (NM crop and Livestock Reporting Service).

t. Percentages of corn and wheat production used for human consumption are not collected in New Mexico.

u. In 1980 New Mexico produced 72,000,000 pounds of sugarbeets, equivalent to 8,603,138 pounds of refined sugar. All sugarbeet production was sent out of state for processing, therefore, 100 percent of consumption is imported.

v. 362,825.7 acres irrigated and 1,737,393.8 acres dry cropland.

The Cornucopia Project



TOWARD A SUSTAINABLE OHIO
IN FOOD, FARMERS AND LAND

A Study of the Food System of Ohio by
JON SHAFER

with
The Cornucopia Project of Rodale Press

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To them and others I may have forgotten, thank you for all your help. For the limitations of this study, I bear full responsibility.

We should think of our resources
not as having been left to us by our parents
but as having been loaned to us by our children.

Kenyan Proverb

PREFACE

The family farm seems to be one of the few healthy traditions left in this country. Part of what feels right about the family farm is its accountability. The temptation to sell off a lot or two for some much needed cash is reduced by knowing that other generations have been similarly tempted and resisted. Nor does it make sense to cheat your children and their children in order to squeeze out a few more dollars at the expense of the land, the same land they'll be getting in time.

In considering changes, it's important to understand why an ancestor did it or laid it out that way before presuming the new idea is better. There is a tradition of viewing land as a work of art in the Utopian novel Islandia, by Austin Tappan Wright. Each generation carefully considers what, if any, additional touches might be made to improve the beauty, health, variety, productivity or balance of the land and what it supports, before changing this treasure that will be the inheritance of the next generation.

My father's ancestors have been farmers for, at least, eight generations. My family has worked our present farm for 102 years. Much of my reason for writing this report arises from a desire to see the land live, though I will die.

As you read this study, please think about how we can be better stewards of Ohio. If you find significant errors or omissions, I'd appreciate it if you would help improve future editions by writing me at Route 2, Box 40A, Cloverdale, Ohio 45827.

February, 1983

Jon Shafer

SUMMARY

A strong and healthy agriculture is necessary for a thriving and healthy Ohio. Evidence from Roman to modern times is used to support this position. While farming is Ohio's leading industry, major weaknesses are evident in agriculture's profitability. Rising supply prices and falling commodity prices have placed most farmers in a precarious position. A "strong" U.S. dollar and weak demand have diminished exports. The export market is fickle, given the many factors which affect it.

Large export-oriented farms are related to a variety of social ills; as studies by Goldschmidt and MacConnell document. Small and medium sized farms, in contrast, show significant social benefits on surrounding communities. Ohio has switched from exporting 37% of its grains and soybeans in 1970 to 73% exported in 1977. Livestock operations were converted to grain farms. Pastures were plowed, and many forests cut because of export pressure. As a result, three-fourths of Ohio's land now needs soil conservation treatment. 132.7 billion pounds of soil are eroding away from Ohio farmland each year. Nationally, erosion is at the highest levels ever recorded, and 25% worse than during the Dust Bowl years. Ohio is essentially exporting its soil and grain to pay for imports of oil. This trading of one natural resource for another helps our international balance of trade, but it is eroding Ohio's strength. This erosion affects not only our economic condition, but our health and security as well.

A danger equal to erosion is the loss of farmland to non-agricultural uses. At the rate of conversion of the past 35 years, Ohio will be unable to feed itself in another 35 years. It takes only about 8.9 million acres for Ohio to feed itself from its 26.2 million acre total. Ohio's farmland total was down to 16 million acres in 1978, with the potential additions from rolling forests being increasingly susceptible to erosion.

Ohio imports 57% of the food consumed in the state. While 60% of our corn and 75% of our soybeans are exported, Ohio imports [illegible]8% of its vegetables and 89% of its fruits. Our grain exports usually leave in their raw state, before any processing occurs. This means many potential jobs are lost. The fruits and vegetables we import have been processed, so most of the jobs inherent in the vegetables' retail value of $923,745,000 were located elsewhere. Ohio is in the condition of a food colony, exporting raw materials at low prices and importing processed materials at high prices.

A Buy Ohio campaign must be augmented with a Grow Ohio effort if we are to extract ourselves from our economic predicament. Ohio's food imports amount to 6 billion dollars, of which about three-fourths is money exported (one-fourth being spent on retailing). Every food dollar we spend is a vote for the food system we get. If the multiplier effect of dollars is included, then almost 12 billion dollars is being lost to Ohio's economy because of our food imports.

Ohio need not import many vegetables, some fruits, butter and cheese, as we now do. Ohio's climate and soils are suitable for many vegetables and some fruits, while only more creameries are needed to transform Ohio's surplus milk into butter and cheese. Tending to Ohio's own food needs first, then exporting the surplus makes sense also because it encourages diversity. In these changing times, diversity makes for flexibility which insures survival and healthy society.

The study concludes with a variety of recommendations to consumers, farmers, state and local government, the food industry and agricultural researchers and assisters. A variety of ways are advanced to help end soil erosion, stop the loss of farmland and increase the food security of Ohio, while benefiting its economy.

A major recommendation is that the Governor, with the assistance of the Director of Agriculture, appoint a Governor's Commission on Food, Land and Agriculture to assess this area in more depth, then propose a State Food Plan which would include appropriate goals, objectives and policies, such as:

- an adequate diet for all Ohioans;
- the preservation of prime agricultural land;
- the conservation and restoration of Ohio's soil and water resources;
- economic justice for farmers and farm workers; and
- optimizing Ohio's food production capacity to ensure an adequate supply of nutritious food at affordable prices.

Today the average morsel of food travels 1,300 miles from farm through processing and warehousing to grocery store and home. With one-third of the price of vegetables attributable to transportation costs and this portion increasing, Ohio needs to focus on its food and soil security. When it does, we will find that the economic benefits of this enlightened action will provide Ohio with more jobs. Our children and grandchildren will be well fed if we face up to our obligation to them and become the wise stewards of Ohio's resources.

The Rapid Destruction of Our Rural Culture.

Small independent farmers have moved to the cities to be replaced by energy-intensive technologies and capital. Rural lands no longer offer any opportunity in time of plenty or a social buffer in time of war and depression. Worst of all, most people view the ruination of rural America as simply an unfortunate by-product of our industrial "progress". But for others agriculture IS a culture and, as noted by Wendell Berry, ". . . a culture is a practical necessity. When a culture is destroyed it is a natural calamity." What has, in fact, been destroyed is the fundamental purpose of agriculture, viz., to create a fulfilling culture whereby productive land can be stewarded and nutured for future generations. In its place a new purpose has emerged: to produce food for profit at the expense of the land (i.e. culture). This new purpose has become the greatest calamity of all.

Richard Merrill
"The Suicide and Rebirth of
Agriculture:
Some Preliminary Thoughts on a
Bioregional Food System,"
RAIN, VII, No. 6 (April, 1981), p. 12.
Reprinted from Raise the Stakes!

INTERCONNECTIONS

A strong and healthy agriculture is necessary for a healthy civilization. This study substantiates that assertion for Ohio by looking at some of the connections between agriculture and other aspects of our society. This review begins with a few economic statistics and continues through a brief literature review that touches on medical, sociological, political and agricultural interconnections.

Net farm income dropped from 20 billion dollars in 1972 to 10 billion dollars in 1982. During the same period, total farm debt has shot up from 38 to 195 billion dollars.[1]

"So what?" many will ask, "things are tough all over." Business closings average 500 a week, the highest since 1930. Our food comes from farms and farmers. If we forget that, in our policies or in our values, we will impoverish ourselves, first in spirit then in the flesh.

The number of farms in Ohio was 220,575 in 1945 and 95,937 in 1978, with only 45,671 operators listing farming as their principal occupation. Concurrently, average farm size increased from 99 to 168 acres.[2] The total number of jobs on U.S. farms is 28% of what it was in 1910-1914. This situation is similar to conditions during the decline of the Roman empire.

> At home, the Roman elite became careless about domestic agriculture. Early Rome had many freeholding farmers, but most of their farms were consolidated into country estates worked by slaves and owned by wealthy people who lived in the city . . . Neither the slaves nor the owners dedicated themselves to the land . . . The former smallholders and free farmhands, when no longer needed on the estates, fled to the cities for employment, and feeding them became a critical problem.[3]

It is not necessary to go back to the Romans to find evidence that the state of the land and the farmer heavily influence the rest of society. One classic study, begun by Walter Goldschmidt in 1944, looks at Arvin and Dinuba, two towns of about 5,000 in the Central Valley of California. Dinuba was surrounded by moderate-sized farms, while Arvin was bounded by large farm holdings. By every measure, the community of Dinuba was better than Arvin. Dinuba had more businesses, with more trade, more self-employed, more paved streets, sidewalks, playgrounds, schools, civic organizations, churches, and newspapers.[4] Goldschmidt lost his job due to pressure from agribusinesses.

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[1] Stephen Kindel and Laura Saunders, "Please come back, W.J. Bryan", Forbes, August 30, 1982, p. 108.

[2] U.S. Bureau of the Census, 1978 Census of Agriculture, Vol. 1, Part 35 (Ohio), p. 1.

[3] Ed Edwin, Feast or Famine: Food, Farming and Farm Politics in America (New York: Charter House, 1974), p. 7.

Recently, a more extensive study of 83 Central Valley communities provided similar findings. "In the search for rural poor we found the most accurate predictor to be the proportion of Class I farms (over $100,000 farm sales/year)."[5] The proportion of absentee ownership seemed to be as important as farm size in these studies, with 160 acres being an optimal size for positive social indicators.[6]

Friends of the Land, a national organization based in Ohio, was a prominent force in soil and water conservation in the Forties and Fifties. Closer to home, the Friends of the Land viewed the health of the land as being closely linked to the health of individuals and regions.[7] The connections between land and people included the political impact of worn-out land, as well as economic, spiritual and medical implications. Sterling Worth of Friends of the Land, believed that abundance must exist in order for democracy to thrive. With such a physiocratic perspective, he tied together soil conservation and conservation of political freedoms: "Every time you see a dust cloud or a muddy stream, you are witnessing the passing of American democracy."[8]

A physician from Gallipolis, Dr. Charles E. Halzer, was a founder and a president of Friends of the Land. Dr. Halzer saw "an inescapable connection" between the soil erosion in southern Ohio and the poor health of his patients. He stated to Hugh Bennett and other new Soil Conservation Service officials that: "There's flesh and blood and vigor washing out of here in the mud of that river."[9] Today the food of most people comes from many distant places. A Department of Defense study calculated the average distance traveled by a morsel of food to be 1,300 miles between farm and plate, given all the steps in between. Today's typical diversity of sources reduces the directness connecting people and soil. The importance of a healthy soil is not diminished, it is merely obscured. Hidden from view are the conditions surrounding the growth of our food. Today most of us are blind to whatever exploitation of farmers, farm workers or land we may be supporting with our food purchases. We are typically also ignorant of the chemical context in which our food is grown, especially of the imports. Many agricultural chemicals banned in this country are still made here and shipped overseas to be sprayed on food we will later import and eat.[10] If we wish to be responsible in our purchases, we must focus them so that we or our government can reasonably guarantee the food's safety.

---

[4] Wes Jackson, New Roots for Agriculture (San Francisco: Friends of the Earth, 1980), pp. 96-97. See Bibliography for the Goldschmidt studies.

[5] Dean MacCannell, Report on his work, presented to An Interreligicus Conference on Public Policy and the Structure of Agriculture, Washington, D.C., December 4, 1980.

[6] Dean MacCannell and Jerry White, Agricultural Land Ownership and Community Structure in California's Central Valley (Davis, CA: University of California, 1981), p. 11.

[7] See for instance Russell and Kate Lord, (eds.), Forever the Land (New York: Harper & Bros., 1950).

[8] Ibid., pp. 49-50.

[9] Ibid., p. 46.

Louis Bromfield was once a well-known proponent of the holistic plan for conserving soil, water and human culture. In addition to numerous novels, Bromfield's writings include collections on conservation, farming and of musings. Malabar Farm, the best known of these books, includes visions of health maintenance, particularly in Chapter XIV, "Out of the Earth We Are Born and To the Earth We Return," which begins:

> There is a new movement going on in medicine and in agriculture which may lead to the most important developments with regard to the health, vigor, longevity and general future of the human race. It is a movement away from patent medicines and toward preventing disease, a movement which plans to lock the stable before instead of after the horse is stolen. Put very simply it is a movement to create health and resistance to disease in plants, animals and humans, rather than to attempt to cure the ills and diseases after they have developed . . .[11]

In short, health maintenance and wholistic health views have come into existence with the rise of ecology and general systems theory as recognized disciplines.[12] The systems view has various names: process theology in religion; Gestalt psychology; holistic philosophy; field theory in physics and cybernetics in communications.

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[10] For full documentation of this situation see David Weir and Mark Shapiro, Circle of Poison: Pesticides and People in a Hungry World (San Francisco: Institute for Food and Development Policy, 1981). The IFDP is at 2588 Mission Street, San Francisco, CA 94110; 415/649-6090.

[11] Louis Bromfield, Malabar Farm (New York: Ballantine, 1948), p. 343. See the bibliography for other Bromfield books on conservation. Malabar Farm, near Mansfield, is now an Ohio State Park with the house furnished as it was during Bromfield's life. His library is worth the trip.

[12] Ludwig von Bertalanffy began in the 1920's to write of "organismic biology" and is generally credited with being the founder of general systems theory in 1948, with the publication of a work by that title.

Conservationists and naturalists have been notable leaders by consistently assuming a systems perspective even before it was given a name. The interconnection of agriculture with the whole can also be seen in current economic and political events.

Ohio farmers, as in many other states, responded to global grain shortage, a devalued dollar and resulting strong prices by shifting to cash grain for export operations. This shift is dramatically seen in out-of-state grain and oil seed shipments: 37% were exported in 1970; 73% were exported in 1977.[13] Five years ago a weakened U.S. dollar encouraged, even allowed, many countries to purchase U.S. grain. Today, with a stronger dollar, many countries can't afford U.S. grain, even at current low prices.

Then too, countries have realized that the U.S. may not be a dependable source of grain and oil seeds. In 1973, when the U.S.'s share of the global soybean market was 90%, President Nixon placed an embargo on soybeans. Brazil started growing soybeans. Today the U.S.'s share of the soybean market is 67%.[14] In 1974, then Secretary of Agriculture, Earl Butz said "Food is a weapon! It is one of the principal tools in our negotiating kit."[15] Secretary Block repeated that assertion several times in his early days in office, unintentionally providing more stimulus for other countries to become food self-sufficient.

The international scene intrudes into Ohio farming practices in other ways. One of the major reasons for U.S. grain exports is to balance U.S. oil imports and avoid a balance of payments deficit. With energy wastage decreasing, we are importing less oil. It is possible that grain export levels have peaked and that grain prices will seldom attain the heights of the 70's in corresponding dollars. In any case, the depressed grain prices demonstrate the danger of specialized export farming. The many foreclosures and bankruptcies of grain farmers, grain elevators and farm equipment dealers teach a somber lesson. Diversity in farming pays off in the long run. Those grain farmers with hogs, chickens or other operations are better off than those based solely on cash grain.

Once again the value of diversity is affirmed, and the dangers of specialization are shown. These lessons are also valid on other levels and will be discussed later. In summary, the general theme of this chapter could be stated as: The well-being of agriculture, and of us all, is too important to be left to the specialists.

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[13] Gary Hennen, etal., Ohio Grain Flows by Mode of Transportation and Type of Grain Firms for 1970 and 1977: A Comparison. (Wooster. OARDC, 1980), P. 4.

[14] Kindel, Forbes, 112.

[15] Time, November 11, 1974.

CONSERVING OHIO WHILE SERVING OHIOANS

> If a farmer fails because he has ruined the land, the ability of many other persons to succeed has also been lost. If too many farmers fail, the ability of society to succeed has been lost. That means the success of the farmers' business is, in part, everybody's concern.
>
> Neil Sampson
> Farmland or Wasteland:
> A Time to Choose
> (Emmaus, PA: Rodale Press, 1981).

The history of conservation in the United States includes two previous peaks of activity and interest. Gilford Pinchot, the Chief Forester under President Theodore Roosevelt, was a leader in 1908, when a White House Conference of Governors focused on new soil conservation. Hugh H. Bennett spearheaded the second wave of activity which tended to the fields. He initiated and became the first head of the Soil Conservation Service. Friends of the Land, a national conservation organization based in Ohio, provided a citizen army for soil and water conservation education from 1940 to 1954. Fifties complacency and rising agricultural productivity are the probable causes of the folding of Friends of the Land. The chart below shows the increased productivity during the Fifties in U.S. agriculture.

Figure 1. PRODUCTIVITY CHANGES IN U.S. AGRICULTURE 1870-1979[16]

Period	Average Annual Percent Change
1870-1900	+1.0%
1900-1925	-0.2%
1925-1950	+1.3%
1950-1965	+2.2%
1965-1979	+1.8%

Another breakdown of production growth rates in the 1960's and 1970's shows an overall 1.4% increase during the 1960's, including "yield" increases attributable to technological advances of 1.6%. The difference is accounted for by a -0.2% decline in planted acreage. The 1970's picture is less promising because planted acreage increases of +2.35% accounted for most of a 3.1% production increase, with "yield technology" providing only a .75% boost.[17]

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[16] Don Paarlberg, "Enough Food? Sure If We Don't Play It Dumb" The 1981 Yearbook of Agriculture, (Washington: U.S. Department of Agriculture, 1981) p. 290.

Considering that by the late 1970's, the land in production in the U.S. (385 million acres) equaled the readily available land, large future acreage increases are unlikely.[18] And future "yield technology" increases may be offset by soil losses.

Soil loss from erosion on Ohio farmland amounts to 132,732,000,000 pounds per year, according to calculations by Dr. Vern Harnapp, a geographer at The University of Akron.[19] This soil loss would be enough to cover the Columbus metro area encircled by I-270 with three inches of topsoil.[20] The lost topsoil could alternatively cover the 54 square miles of the city of Akron with a twelve inch layer. While this erosion is less than the national average of 5.1 tons/acre/year for cultivated cropland, current national erosion levels are 25% worse than during the dust bowl years of the 1930's.[21]

During our frontier past, wasted, eroded land could be abandoned and new land cultivated. Now little new land remains. In Ohio as of 1977 there were 659,000 acres identified as having "high potential" for conversion to cropland.[22] This amounts to 5.6% of Ohio's 1977 cropland base. About a third of this high conservation potential land falls into sub-classes IIE and IVE, which are particularly susceptible to erosion. The 1980 appraisal carried out under the Soil and Water Resources Conservation Act reported that a decrease in yield of up to 34% was possible in land capability sub-classes IIE, IVE and VIE if current erosion rates continued for fifty to one hundred years.[23]

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[17] Dennis Henderson & Wallace Barr, "Economic and Political Environment for the Agrifood System in the 1980's," unpublished manuscript, Ohio State University, Department of Agricultural Economics & Rural Sociology, 1982, p. 34.

[18] Harold Breimyer, talk given to Interreligious Conference on U.S. Agricultural Policy, Washington, D.C., December 4, 1980.

[19] Soil Conservation Service, Ohio Resources Inventory (Columbus: S.C.S., 1977), p. 11. Dr. Harnapp multiplied the acreage of cropland, pastureland and forestland by 3.6, 3.6 and 2.5 tons/acre/year to arrive at the above figure.

[20] These equivalent areas are figured assuming 160 tons of soil would cover an acre with a layer one inch deep.

[21] "Our Thinning Soil", Land Resource Use and Protection, Report No. 38 (Ames, Iowa: Iowa State University, 1975), p. 1.

[22] Soil Conservation Service, p. 16.

Ohio also has 1,341,000 acres in pasture, woods and other uses which has "medium potential" for conversion to cropland.[24] However, 48% of it is in the high erosion sub-classes mentioned above. Consequently, Ohio could convert more area into cropland, but with the danger of increased erosion. Conservation measures on highly erodable soil are possible in many cases, but expensive. One has a choice: 1. increased erosion and limited production; or 2. sustainable production at an increased cost. Figure 2 summarizes the status of conservation treatment and sheet and rill erosion (non-gullied slippage).

Figure 2: OHIO LAND STATUS IN 1977[25]

	%	Acres (1,000)	Average Soil Loss (Tons/Acres)	% of Land Needing Conservation Treatment	Total Sheet & Rill Erosion Loss-year (1,000 Tons)
All Cropland	45	11,749	3.6	68%	42,199
Pastureland	10	2,614	3.6	78%	9,449
Wood/Forest Land	23	5,860	2.5	88%	14,718
Urban, Built-up Transportation	16	4,194	---	---	---
Other	6	1,454	---	50%	---
TOTAL		25,871		74%	66,366 (farmland)

The major change from 1967 to 1977 has been a loss of cropland (49% in 1967) and an increase in urban and built-up land (11% in 1967). Data for 1982 will be available in early 1983.

Ohio's topsoil is being depleted unnecessarily. It is being washed and blown away and built upon at rates that darken Ohio's future.

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[23] U.S. Department of Agriculture, Soil, Water and Related Resources in the United States: Analysis of Resource Trends, R.C.A., 1980 Appraisal, Part II (Washington: U.S.D.A., 1981), p. 34.

[24] Soil Conservation Service, p. 16.

[25] Ibid, pp. 3, 7, 9 and 11.

In the past chemical fertilizers have made up for some of the soil erosion with higher yielding seeds and improved cultivation practices more than compensating for the rest. However, the cost of importing potash from Canada and phosphate from Florida is rising rapidly as supplies are depleted. Three ammonification plants in Ohio convert natural gas into nitrogen fertilizers. With the increases of both natural gas prices and the cost of electrical energy needed for conversion, the price of nitrogen fertilizers has tripled in the last few years. Total fertilizer consumption in 1981 was a record 2,420,000 tons, surpassing the 1980 record use by two percent.[26]

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[26] Ohio Crop Reporting Service, Ohio Commercial Fertilizers, December 1, 1981, p. 1.

FROM AGRARIAN TO INDUSTRIAL FOOD

> The transformation from an agrarian to an industrialized food system is now nearly complete. The results are clear: technological innovations have replaced labor on farms, and specialization of work roles in the food system has increased dramatically. The farmer no longer hoes his own corn, raises his own power, prepares his own feed, or delivers his products to the general store in exchange for merchandise desired by his farm-family unit. The hoe has been replaced by chemical pesticides, the horse by a tractor, the corn grinder by a large computer-controlled feed formulator.
>
> Dennis R. Henderson and
> Wallace Barr
> Ohio's Food and Farm System
> in Transition
> (Wooster, Ohio: Ohio Agricultural Research and Development Center, 1982), p. 1.

Dennis Henderson and Wallace Barr, of the Ohio State University's Department of Agricultural Economics and Rural Sociology, have recently completed a study of Ohio's Food and Farm System in Transition. Anyone interested in Ohio's agriculture will find this report stimulating reading. Overall, they find that "the transformation from an agrarian to an industrialized food system is now nearly complete."[27] Within the general trends of specialization and interdependence, they identify areas where specialists have assumed roles the farmers used to fill. Equipment mechanics, market analysts, soil consultants, and chemical sellers and appliers are among these specialists.

The tripling of tractor horsepower in 30 years, of agricultural chemical use in 20 years, and of manufactured feed and fertilizers in 15 years are some of the statistical symptoms of the general trend toward specialization in U.S. agriculture.[28] Employment has moved from the farm to specialized non-farm jobs, such as fertilizer distributors and petro-chemical manufacturers, in other parts of today's food system. A number of these former farmers in non-farm food jobs live in cities, along with 80% of Ohio's population. And increasing numbers of farmland owners live off the farm, as farm mergers and share-cropping increase.

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[27] Dennis R. Henderson and Wallace Barr, Ohio's Food and Farm System in Transition. Ohio State University, Department of Agricultural Economics & Rural Sociology. Research Circular No. 273 (Wooster, Ohio: Ohio Agricultural Research and Development Center, 1982), p. 1.

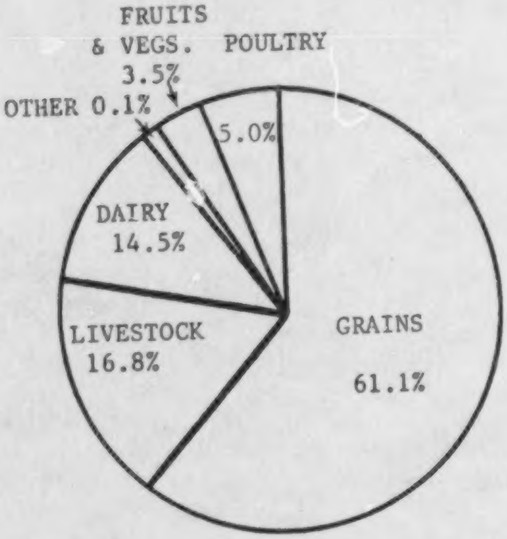
[28] Ibid., p. 2.

There is a negative correlation between absentee land ownership and conservation practices, as the former has increased while the latter has decreased. The MacCannell study mentioned earlier linked absentee ownership with other negative factors. Farm mergers and absentee ownership are signs of the increasing size of the average farm, which has nearly doubled since World War II. Larger farms are also symptomatic of cash grain farms, that is, raising grain to sell, rather than for on-farm feeding.

The type of farming in Ohio is of major importance to those interested in food diversity and sufficiency. Henderson and Barr find that already in 1977 grains accounted for 61% of farming income in Ohio, as Figure 3 shows.

> Farming in Ohio is rapidly becoming specialized in cash grain production. Contributing to this development has been the price advantage along with improved yields of corn, soybeans and wheat. Demand, particularly for grain exports, has grown sharply. The same cannot be said for many of the other crops, including tomatoes, potatoes and sugar beets. Expectations are that the three major grains will continue to increase their share of total crop land average in Ohio.[29]

Figure 3: VALUE ADDED TO FOOD IN OHIO IN 1977 BY FARMING ($2.049 Billion)[30]



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[29] Ibid., p. 17.

[30] Ibid., p. 9.

Figure 3 shows the breakdown of farm income in Ohio by major categories. The value added total ($2.049 Billion) is the amount of the cost in Ohio's food consumption that was added by the farming operation itself. Figure 3 shows that 61.1% of the value added to Ohio food consumption at the farm derive from grain production in Ohio.

Figure 3 also serves to illustrate the difference between the value added economic approach, used in the Henderson-Barr study, and the food systems approach used in this report. In value added economics, dollars are watched and assigned to different levels of operation. In the food systems approach, the food itself is traced. In the next chapter, food consumption is compared with food production for the state. Net import or export figures are then calculated for each of a hundred or so food commodities. Figure 3 highlights the difference by looking at grain as a case in point.

The value-added approach of Figure 3 combines production and consumption, and the 61% figure applies to the production value of grain in Ohio's farm system. However, in terms of direct human consumption, Ohio grain value is only 33% of the value of Ohio's food production.[31] Most of the corn and beans grown are eaten by livestock, and we eat them or their products. Thus direct grain consumption per capita is less than 200 pounds per year, while counting the grain fed to livestock results in about 2,000 pounds per year in human consumption. In the Ohio food production, this study separates out the grain fed to livestock and does not include it in the food consumed category. Food consumption data indicates that human grain consumption is only 6.2% of home food expenditures.[32] By using actual consumption data, this study arrives at distinctly different figures than the Henderson-Barr research.

A recent study of Ohio grain flows reveals that 60% of Ohio's corn is exported, 75% of our soybeans and 40% of the wheat. Since so much of Ohio's acreage is devoted to export production, Ohio must import many food stuffs which we could grow and process here. The grain exports are generally shipped out in their original form, so no processing jobs are created. Meanwhile Ohio's food imports have been processed elsewhere, draining Ohio dollars to pay for jobs elsewhere. However, if one assumes that all farm production in the state is part of the food consumed in Ohio, then Ohio appears to be almost self-sufficient in food. For example, the flow chart below indicates that 85% of the value in the food production used in the state is added within the state. The next chapter provides a different perspective.

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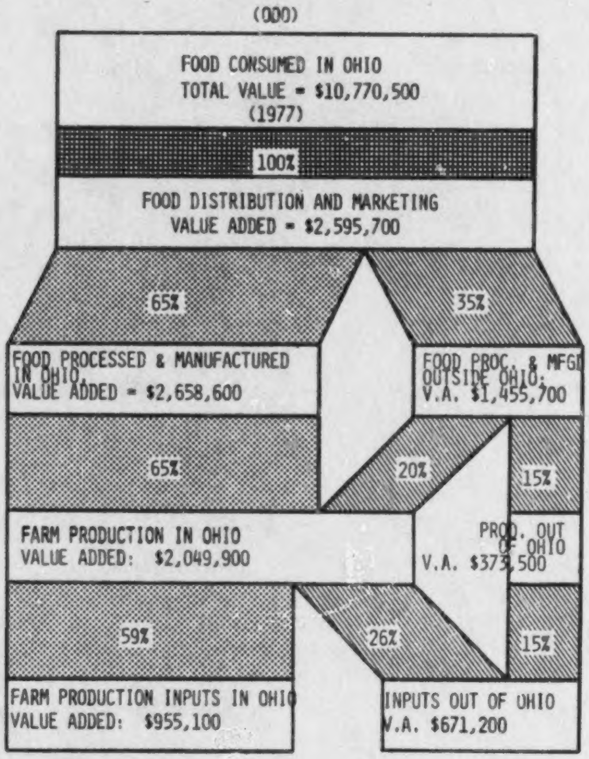
[31] The Ohio Food Production and Consumption chart, Appendix I, shows retail value of production for many commodities. Adding up the value of the grain eaten by people, a total of $2,328.525 million dollars is reached, while the total retail value of Ohio food production is $7,023.677 million dollars. Dividing the first by the second results in the .33 figure.

[32] U.S. Department of Agriculture, Food Consumption, Prices and Expenditures, 1960-80 (Washington: Government Printing Office, 1981), p. 104. From Statistical Bulletin #672, Table 91, "Total Farm Value By commodity group for domestic farm food products bought by civilians." 6.2% is the total of the "Grain Mill" and "Bakery" categories.

Figure 4: VALUE ADDED TO FOOD CONSUMED IN OHIO BY COMPONENT INDUSTRIES, 1977[34]


(000)
FOOD CONSUMED IN OHIO
TOTAL VALUE = $10,770,500
(1977)
100%
FOOD DISTRIBUTION AND MARKETING
VALUE ADDED = $2,595,700
65%
35%
FOOD PROCESSED & MANUFACTURED IN OHIO
VALUE ADDED = $2,658,600
FOOD PROC. & MFG
OUTSIDE OHIO:
V.A. $1,455,700
65%
20%
15%
FARM PRODUCTION IN OHIO
VALUE ADDED: $2,049,900
PROD. OUT OF OHIO
V.A. $373,500
59%
26%
15%
FARM PRODUCTION INPUTS IN OHIO
VALUE ADDED: $955,100
INPUTS OUT OF OHIO
V.A. $671,200

Ohio's Food and Farm System in Transition concludes by noting the rapid increase in farm level concentration. What this means is that a lot of farmers are going under, and the survivors grow larger by absorbing their neighboring farms. Henderson and Barr see growing "opportunities for alienation and . . . industrial strife" in the future of Ohio's food and farm system.[35]

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[33] Gary Hennen, et al., Ohio Grain Flow by Mode of Transportation and Type of Grain Farms for 1970 and 1977: A Comparison (Wooster, Ohio: O.A.R.D.C., 1980), p. 4.

[34] Henderson and Barr, p. 9.

[35] Ibid., p. 24.

HOW MUCH OF OHIO'S FOOD IS OHIO RAISED?

> In no other field of activity can the whole principle of the Reverence for Life, which may indeed constitute the very basis of the preservation of our civilization, be so thoroughly, easily and profoundly understood and exercised as in the field of agriculture for, as I have pointed out many times in this book, it is the only profession in which man deals constantly with all the laws of the universe and life. A productive agriculture of high quality is the very foundation of our health, our vigor, even of our intelligence, for intelligence expands, grows and functions best in a healthy and vigorous body.
>
> Louis Bromfield
> From My Experience
> (New York: Harper and Brothers, 1955), pp. 348-349.

The Ohio Food Production and Consumption (Appendix I) chart at the end of this report shows that 43% of Ohio's food is raised in Ohio. These are conservative figures since retail data on many imported fruits were not complete. The total retail value for consumption listed on the chart reflects about 90% of the actual total for retail food purchases in Ohio. Much of the remaining 10% would fall into the "junk food" category, and would be difficult to trace back to its real food basis.

Basically, Ohio imports meat, fruits and vegetables and exports most dairy products. Grains show a marked division with the major exports being corn, soybeans and soft wheat. But Ohio imports all of the wheat used in bread and buns, as well as some barley, oats, rice and rye.

A look at the grain section will reveal that while enough barley, oats and rye are grown in Ohio for the state's people, only 2.4%, 8% and 14.7% respectively, of these grains end up as people food.[36] The great majority of all grain, except wheat, goes into livestock feed, where it is converted into human food.

Transportation Considerations

Ohio has four soybean processing plants, thirteen flour millers and, in Toledo, major export grain terminals. In 1970, 75% of all grain and oilseed exports in the country left through Toledo and the St. Lawrence Seaway.[37]

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[36] These percentages are from the National Feed and Grain Association and are based on national grain disappearance. 9.75% of corn and 2% of soybeans are consumed by humans, according to the Corn Refiners Association and The American Soybean Association.

[37] Hennen, p. 34.

This outlet provides a transportation rate advantage, increasing corn and bean prices paid to farmers by 10-15%. Because of these and other facilities, over a hundred million bushels of grain from other states pass through Ohio.

Inefficiency marks the global transportation of many food items. Ohio has a marked transportation advantage in vegetable marketing over California.

> "Within a 200-mile radius of Columbus there are 26 million people. Within a 500-mile radius lives 52% of the U.S. population and about 40% of the Canadian population."[38]

Ohio Vegetables

Ohio production of vegetables and potatoes has increased 16.2% from 1970 to 1982. As of 1980, the state was self-sufficient in only three vegetable areas: cabbage for sauerkraut; cucumbers for pickles, and escarole/endive. Even though Ohio was second in processed tomatoes, we still imported 28% of that item. A partial reason for this apparent incongruity is the vast distance between the second and first ranked states, which is California, of course, with 11,082,000,000 pounds. Concentration of supply and a growing importation of tomatoes from Mexico seem to be the causes for Ohio's importing tomatoes.

Home gardens production does not appear in this food chart, since the produce is not commercially available. According to a Gallup Poll survey, 54% of Midwestern households had gardens in 1980, with the average yield being 588 pounds of food, valued at 460 dollars per garden.[39] If Ohio's 3,338,000 households garden in comparable numbers, then 1,962,744,000 pounds of food are produced worth $1,535,480,000. Most of this food would be vegetables, with some fruits.

According to William Brooks, O.S.U. Extension Horticulturalist:

> "Three-fourths of Ohio's land is suitable for vegetable growing. And there is an increasing interest on the part of supermarket chains of locally grown produce. We have a nice early vegetable area in southeast Ohio, which has been increasing in production by 15-20% in the last couple of years.
>
> We're in a good, central location; we have the right kind of soil, the climate, and the resources. The potential for increased production, keyed to aggressive marketing, is a very positive situation."[40]

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[38] Irene Clepper, "Vegetable Market Potential Increasing", The Packer June 26, 1982, quoting Gene Wittmeyer, OSU Extension Horticulturalist.

[39] Gardens for All, National Gardening Survey, 1980-1981, conducted by The Gallup Organization for The National Association for Gardening, Burlington, Vermont.

[40] Clepper, op cit.

With encouragement from the government of Ohio, this state could grow most of the vegetables it consumes, as well as many of the non-citrus fruits. In 1980, Ohio's vegetable imports had a retail value of $923,745,000, while our exported vegetables were worth only $74,863,000. We are even worse off in fruit importing at least 89% of all fruits, compared to vegetable importation of 68%.

Economic Impacts

Ohio has declined 17% in meat production from 1970 to 1980, while the South and West have increased their share.[41] According to Dean Baldwin and Don Larson:

> Important factors which contributed to this change of location in livestock production were innovations such as boxed beef, improvements in transportation facilities and improvements in cooling and freezer systems which permitted shippers to move livestock products relatively long distances from the production centers to the consumption centers. In addition to these innovations, the meat packing industry which had been centered in the Midwest, closed obsolete plants and relocated new facilities in the South and West.[42]

It is likely that rising energy/transportation costs will change the above "improvement" into liabilities. Ohio provides exports in all dairy products except butter and most cheeses. We have remained largely self-sufficient in dairy because the transportation cost of $1.50 per hundred weight of milk from Wisconsin to Ohio helps provide a sufficient market advantage to maintain Ohio's dairies.[43]

Overall, the retail value of the food Ohio imports is $6,027,004,000. Since about a quarter of the typical food dollar goes to distribution and marketing, not all six billion is lost to Ohio's economy. However, if one considers that for every dollar remaining in the state, $2.60 of local business is generated, almost twelve billion dollars is being lost to Ohio's economy through the current food system.[44] $1,103 per Ohioan is what stands to be gained for Ohio's economy if Ohio were to become self-sufficient in food.

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[41] Ohio's dairy industry remained constant through the O.A.R.D.C., Ohio Agricultural Statistics, 1970-1975, p. 48; O.A.R.D.C., Ohio Agricultural Statistics, 1976-1979, p. 50; and O.C.R.S., Ohio Agricultural Statistics, 1980.

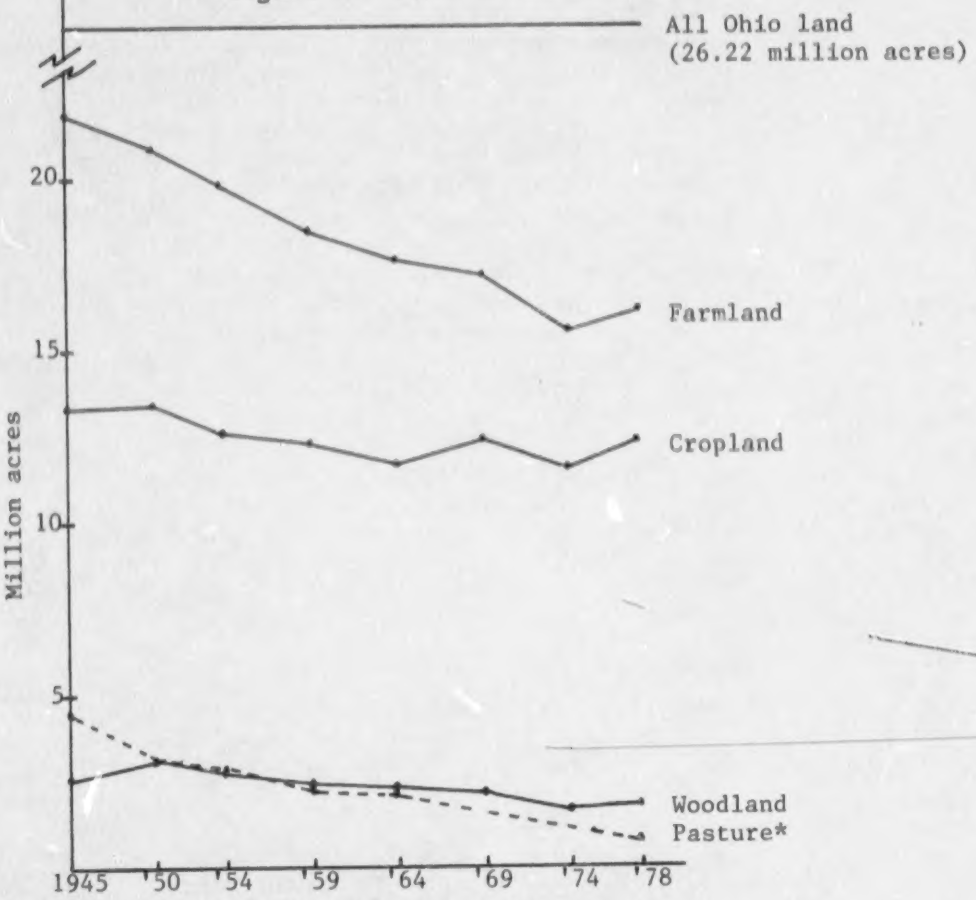
[42] In Projected Production of Grain and Oilseeds and Consumption by Livestock in Ohio for 1985, 1990 and 2000, (Wooster, Ohio: O.A.R.D.C., 1981) AERS Research Report #1, p. 25.

[43] Conversation with Floyd Groff, Jr., Continental, Ohio, dairyman, on December 16, 1982.

Ohio's Land and Its Use

Natural resources need to be considered as well when thinking about Ohio being more self-reliant in food. As the Food Chart shows, adding up the acreage required to grow all of the climatically possible food yields a total of 8,942,243 needed acres. Ohio includes 26.22 million acres, of which the total cropland is now (1983) 12.06 million acres. Figure 5 below shows Ohio land use from 1945 to 1978.

Figure 5: OHIO LAND USE[45]



* Other than that used for cropland and woodland

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[44] Conversations with Dennis Henderson and George Morse, Ohio State University, Department of Agricultural Economics and Rural Sociology. $6,027,004,000 × 76% = $4,580,523,040 × $2.60 = $11,909,359,900.

[45] U.S. Bureau of the Census, 1978 Census of Agriculture (Washington: Government Printing Office, 1981), p. 1.

Notice the sharp decline in total farmland and the gradual decline in total cropland. Over the 33 years from 1945 to 1978, the average cropland loss was 32,600 acres per year. Should this post World War II trend continue, in 96 years Ohio's land reserve of 3.12 million acres will be gone. Beyond that point, Ohio will have lost the capacity to feed itself, let alone export food.

Unfortunately, if current patterns continue, Ohio has much less than 96 years to save an adequate land base. In 35 years Ohio could lose the capacity to feed itself, let alone export food, if current trends of farmland loss continue. This is because the sharply dropping farmland acreage will, at the average rate of the past 40 years, force cropland to drop below our needed acreage of 8.94 million acres by 2019. Assuming a continuing loss every five years of 884,385 acres, Ohio could be unable to feed its current population, because of lost land. It is calculations such as these that led the Midwest Governors Conference to discuss a Soil Depletion Tax recently. Land and soil are finite natural resources which have been slowly created over millions of years. For Ohio to lose almost nine hundred thousand farmland acres every five years for the past thirty-five years is shortsighted to the point of inexcusable.

Already there are thousands of Ohioans suffering from hunger and malnutrition because of their low income, lost jobs, and escalating food prices (at a time of falling crop prices). As prime agricultural land becomes more scarce and valuable, beginning farmers will have no hope of capitalizing a start in agriculture, causing even more rapid concentration of ownership. The quality of life would decline for all in this case, as the Goldschmidt and MacCannell studies show. That's what could happen, unless we in Ohio become active and stop these dangerous trends. The recommendations that follow are offered as a starting point in this essential work.

RECOMMENDATIONS

The overall goal of this effort is for Ohio to be secure in its food supply. Food security means:

- an adequate diet for all in Ohio;
- securing economic justice for farmers and farm workers;
- conserving soil and water resources;
- preserving prime agricultural land;
- using renewable, permanent energy resources whenever possible throughout the food and farm system;
- strengthening the family farm system and farming communities;
- developing a regional food system that ensures the availability of nutritious food at affordable prices; and
- coordinating the economic system so as to foster sound agricultural development.

Toward these ends a series of more specific recommendations follow addressed to consumers, farmers, state and local governments, industry and research groups.

I. Recommendations to All.

1. Be conscious of what you eat and drink by reading labels. Learning about proper nutrition, exercise and rest, then applying this knowledge is the most important thing you can do to assure good health.

2. Eat locally or regionally produced food whenever possible. Each dollar you spend on food is a vote indicating the kind of food system you want. In the event of a real crunch, you'll want strong food sources close by. Frequent roadside stands, pick your own places and farmers markets. Ask for local produce in grocery stores.

3. Buy extra fresh food at the season's peak, when the price is lowest. Process and store it for off season use. For ideas on seasonal recipes month by month, you may want to buy a mini-Mich seasonal cookbook for $1.00 from the Land, Food and Justice Committee, Interfaith Council for Peace/CALC, 604 East Huron, Ann Arbor, MI 48104.

4. Plant and tend a garden if you're able. If you need land, ask around. It's likely you'll be able to find some available for the caring or surplus sharing. A community garden group may be able to help transform vacant lots into city gardens.

5. Extend your growing season with cold frames (also called solar grow frames) and/or container gardening.

6. Join and work with a local food cooperative or organization. If you don't know of the closest co-op, contact The Federation of Ohio River Cooperatives, 320 Outerbelt Drive, Suite E, Columbus, Ohio 43213; (614) 861-2446. Many food and farm groups exist, so look

around for one suited to your taste. If you don't know where to start, see the list of organizations at the end of this report. There is a Food Task Force working to get these recommendations implemented. Please contact us at 65 South Fourth Street, Suite 400, Columbus, Ohio 43215 or through the author.

7. Investigate the need to protect prime farmland in your area. Lobby the appropriate authorities to save the best land for farming. Start a land trust, if necessary, to purchase selective farmland that is threatened by non-agricultural use. A land trust is a non-profit corporation which can own real property or interest in real property. Check with The American Farmland Trust for details.

II. Recommendations to Farmers.

1. Work together with other farmers to save family farming. If industrialization of agriculture proceeds much further, only large corporations will have the initial capital and be able to risk farming.

2. Conserve your soil. It has taken millions of years to make it, don't let it wash away in a few decades. You know your land. Talk over your erosion problems with the Soil Conservation Service, agree on regenerative steps and get partial funding from the Agriculture Stabilization Conservation Service office in your county.
   a. Take severely eroding land out of production.
   b. Graze livestock on marginal, hilly land.

3. Reduce your energy use in fuel, fertilizer and petro-chemicals. Since petroleum prices will be rising again, use this temporary respite to figure out renewable energy alternatives. Maximize natural fertilization possibilities, such as manure, plowing down green manure crops, earthworms, appropriate rotation with legumes, etc. Utilize no and minimum tillage practices. Use a good soil testing service to prevent over-fertilization and wasted money.

4. Work with or start a co-op to generate methane, refine sunflower oil into diesel fuel, bulk buy and sell. There is strength in numbers.

5. Save good farmland for farming. Check out state legislation for preserving prime farmland. Work to strengthen and pass good legislation.

6. Grow food for people, instead of for export. Examine the Food Chart to see what foods are in short supply in Ohio and whose desired climate and soil are the same as yours.

7. Sell directly or more directly, and keep the middle person's share. We farmers need to get a larger share of the food dollar if we're to survive. Consider starting a producer or processor co-op to help promote your product in local institutions and food stores. Small scale processing of meats, pickles, cheese and produce can be an easy way to increase your income.

8. Use a variety of seed varieties, minimizing the chance that a disease can take the whole crop. And before selecting a variety, check local direct buyers to determine their preferences.

9. Use integrated pest management (IPM) and other natural methods of pest control, thereby reducing costs and energy use.

III. Recommendations to Local Government

1. Authorize a department and staff to promote local food production and processing. This will stimulate your economy and create jobs.
   a. Encourage all agencies to buy local food.
   b. Stimulate food self-reliance projects at all parts of the food system. This could include greenhouses, community canning and storage centers and other small enterprises.
   c. Promote contract growing with local growers, by public and private agencies and individuals.
   d. Use previously wasted heat for greenhouses: co-generation.
   e. Revise planning requirements to encourage gardening, especially for new multiple-unit housing projects.
   f. Plant trees for conservation, shade, cooling, windbreaks, food and fuel.
   g. Ensure solar access rights are guaranteed by law.

2. Encourage local markets.
   a. Set up a farmers' market, if needed, choose a good location and promote it.
   b. Facilitate mobile farmers markets visitation of neighborhood centers, housing projects, etc.
   c. Assist in the establishment of food co-ops and neighborhood preservation centers.

3. Have the planning commission give high priority to protecting prime farmland in your zoning and land use regulations. "Leap frog" development costs more and causes everyone problems. Consider creating agricultural open-space preserves.

4. Promote gardening by assigning staff to locate and make available unused public and private land for community gardens. Promote technical assistance in cooperation with appropriate federal and state agencies.

5. Lobby at the state and federal levels for needed farm and food legislation. Food is everyone's special interest.

6. Use organic leftovers like leaves and sewage for compost. Keep harmful chemicals out of the sewers, and after primary treatment the sludge can be sold or pumped into irrigation systems. Establish or help start recycling facilities if none exist.

7. Determine if a "food hot line" is needed for those in need of emergency food. Establish a "food bank", if needed.

8. Engage in educational programing on the food system and help provide technical assistance in specific areas of need.

9. Start joint planning agreements with neighboring governments to protect farmland and discourage suburban spread.

10. Assist in soil and water conservation efforts with appropriate monitoring, planning, and regulation.

11. Help planners and developers select the appropriate locations for factories, homes, shopping centers, schools and other buildings. The Land Evaluation and Site Assessment program being set up by the Soil Conservation Service could help.

IV. Recommendations to State Government.

1. The Governor, with the assistance of the Director of Agriculture, should appoint a Commission on Food and Agriculture and charge it with researching and drafting a State Food Plan. Such a plan would include:
    a. Goals for the state in food and farm matters;
    Suitable goals might include:
        1. An adequate diet for all Ohioans:
        2. The preservation of prime agricultural land;
        3. The conservation and restoration of soil and water resources;
        4. Economic justice for farmers and farm workers;
        5. Optimizing Ohio's food production capacity to ensure an adequate supply of nutritious food at affordable prices;
        6. The preservation of the family farm system;
        7. Maximizing Ohio's use of solar and other renewable, permanent energy resources; and
        8. Stimulation of Ohio's economy.

    b. Reviewing the economic plight of Ohio's farmers to determine what the state can do to help;
    c. An assessment of the state of Ohio's soils, farmland, waters, forests, and other agriculturally related natural resources with suggestions for steps to maintain or restore their health.

2. Promote Ohio agricultural production by:
    a. Designating the Director of Agriculture to assume the leadership in devising ways for Ohio to diversify its agricultural production;
    b. Offering incentives for farmers to diversify their farm production;
    c. Mandating that the Cooperative Extension Service prodice appropriate technical assistance;
    d. Investigating grocery-chain buying patterns to determine the causes for discrimination against local produce, and take appropriate legal action;

e. Assigning appropriate bodies to research the extent to which Ohio could be food self-sufficient and the economic results of such a situation.
f. Establishing state experimentation and demonstration plots to determine the most suitable varieties of imported species for Ohio's climate and soils;
g. Encouraging homesteading and discouraging hobby farm tax shelters for the wealthy by appropriate revisions of real estate taxation;
h. Designating state tax credits for farm and home production, preserving, and storing of food;
i. Investigating and promoting the creation of more food processing facilities and jobs in the state; and
j. Increasing the profitability of farming.

3. Preserve prime farmland by:
   a. Mapping all land to identify those areas in need of protection;
   b. Devising appropriate land use requirements to assist farmers in keeping farm land in production and out of the hands of speculators;
   c. Investigating all state-owned farmland to assure its adequate maintenance; and
   d. Monitoring land transactions more carefully to be aware of any corporate or foreign land purchases.

4. Conserve and restore Ohio's topsoil by:
   a. Assessing the workability of existing laws on soil erosion and correcting those in need;
   b. Linking economic programs for farmers to good stewardship practices;
   c. Taxing soil losses in excess of replacement levels;
   d. Rewarding soil regeneration through use of tax credits, enhancement of existing conservation programs, and encouragement of healthy agricultural practices; and
   e. Educating all Ohioans to the need for, and their role in, conserving Ohio's topsoil.

5. Increase local marketing programs by:
   a. Promoting direct marketing through farmers markets, roadside stands, and pick-your-own operations;
   b. Establishing a computer service to get and keep Ohio producers in touch with buyers around the state;
   c. Promoting both a Grow Ohio and a Buy Ohio campaign (on which a good start has been made). Great strides can be made in growing more fruits and vegetables and processing more butter and cheese; and
   d. Give preference to in-state producers as suppliers for state institutions.

6. Strengthen agricultural energy conservation programs and so stimulate the economy by:
   a. Giving high priority to ag energy conservation in state research;

b. Giving priority to ag energy conservation work through the Cooperative Extension Service and other technical assistance programs;
c. Developing state demonstration projects and other educational programs to help farmers, processors and everyone convert from temporary energy sources to permanent ones; and
d. Providing low-interest loans and tax credits to promote energy conservation.

7. Educate state personnel and the general public about the importance of having a strong, durable agricultural system by:
   a. Directing appropriate state programs to include agriculture and food education along with related educational programs;
   b. Stressing the need for regional food security by research and demonstration projects;
   c. Planning for food crises that might arise from strikes, fuel, shortage, pests, droughts, floods, and other natural diseases; and
   d. Promoting nutrition, exercise (through gardening) and rest as natural, effective ways to maintain good health and keep down medical expenses.

V. Recommendations to the Food Industry.

1. Regionalize food purchasing, processing and distribution. Anticipate the increases in transportation costs yet to come.

2. Grocers should optimize their purchases of locally grown food by promoting it, especially in peak season, as being fresher, cheaper and more nutritious.

3. Minimize energy costs by less processing, simpler or bulk packaging, and reducing or using the most efficient transportation.

4. Develop good public relations material emphasizing use of fresh, nutritious foods from Ohio.

VI. Recommendations to Agricultural Research and Assistance Agencies.

1. Plan for optimal food self-sufficiency for Ohio and work out the steps involved in getting there.

2. Determine how, where and which varieties of plants and animals can best be grown or raised in Ohio. Especially promote the increased production of food commodities which are in short supply in Ohio.

3. Continue and expand research and application of energy-saving on renewable energy-using techniques.

4. Orient all work to the sustain-yield levels suitable to the carrying capacity of Ohio.

5. Develop new varieties of plants and animals better suited to Ohio's climate and soils.

6. Investigate and promote rural health in terms of reducing or eliminating cancer-causing and mutation-causing agricultural chemicals.

7. Intensify efforts to reduce all soil erosion to or below levels matched by the topsoil making capacity of the land.

8. Promote tree farming and reforestation of severely eroded, hilly areas.

9. Guarantee that all strip-mined land be restored to acceptable pre-mining conditions.

10. Orient your work more to the small and medium size family farm operations. This applies to cropping patterns, marketing, appropriate scale equipment.

11. Work out ways of using all suitable organic products in the state so as to increase soil fertility. Waste recycling and composting assistance is especially needed.

12. Promote use of effective natural methods of weed and insect control.

13. Develop more energy efficient methods throughout the food system.

14. Promote and assist in the optimization of food production close to cities, in order to reduce transportation costs and increase food security.

OVERSIZE FOLDOUT(S) FOUND HERE IN
THE PRINTED EDITION OF THIS VOLUME
ARE FOUND FOLLOWING THE LAST PAGE
OF TEXT IN THIS MICROFICHE EDITION.

SEE FOLDOUT NUMBER 1-2

APPENDIX II: BIBLIOGRAPHY

If the size of the full bibliography is overwhelming and you don't know where to start, here are some recommendations.

Berry, Wendell. *The Unsettling of America: Culture and Agriculture. San Francisco: Sierra Club Books, 1977.* 228 pp.

If you read only one book about agriculture, this is the one to read. Today's best essayist takes a long, good look at what is happening and what it means.

Conference on Alternative State and Local Policies. *New Directions in Farm, Land and Food Policies: A Time for State and Local Action.* Joe Belden, *et al.*, editors. 2nd Edition. Washington: Conference on Alternative State and Local Policies, 1980. 320 pp. $9.95.

An excellent resource with sections on: Strengthening the Family Farm; Protecting Farm Land; Conserving; Supporting Low-Income Farmers; Building Urban and Consumer Food Policies; Implementing State and Local Food Plans; and Resources and Contacts.

Contact: The Agriculture Project, Conference on Alternative State and Local Policies, 2000 Florida Avenue, N.W., Washington, D.C. 20009; (202) 387-6030.

Cornucopia Project, The. *Empty Bread Basket?* Emmaus, PA.: Rodale Press, 1981. 189 pp. $5.95.

The sub-title describes it: The Coming Challenge to America's Food Supply and What We Can Do about It.

Contact: The Cornucopia Project of Rodale Press, 33 East Minor Street, Emmaus, PA 18049; (215) 967-5171.

Henderson, Dennis and Wallace Barr. *Ohio's Food and Farm System in Transition.* Research Circular 273. Wooster: OARDC, 1982. 24 pp. No charge.

See the chapter, "From Agrarian to Industrial Food."

Contact: Mailing Room, Ohio Agricultural Research and Development Center, Wooster, OH 44691.

Jackson, Wes. *New Roots for Agriculture.* San Francisco: Friends of the Earth, 1980. $4.95.

A fine description of where we are, how we got there and some intriguing ideas on how to get out.

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"If at times in this book the tone of writing appears to be unduly controversial, I attribute this to long contact with many of the closed minds and the unimaginative mentalities with which agriculture, like any other science, is afflicted. Some of the chapters require hard concentration on the technique of farming, some are concerned with philosophical reflection and others may seem light to the point of triviality."

Bromfield, Louis. Out of the Earth. New York: Harper & Brothers, 1950. 305 pp.

"This book ... is ... not written for the practical farmer alone but for those hundreds of city and suburban dwellers ... who have a lively and even recreational interest in reading about everything which concerns agriculture, wildlife, nutrition and in general that vast and complex world with which good agriculture is concerned." (p. ix.)

Bromfield, Louis. Malabar Farm. New York: Ballantine, 1948.

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"Set in The Pacific Northwest, *The Future Is Abundant* is a resource and a mode for everyone seeking regional self-reliance. It is a blend of articles, ideas and access information with references to hundreds of books, periodicals, tool sources, organizations, and seed and nursery companies. Included are dozens of new crops, new techniques and new ideas that are part of the current explosion of innovation in agriculture, aquaculture and forestry."

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APPENDIX III
LISTING OF OHIO FOOD ORGANIZATIONS

Adams County Dairy Service
Cooperative Association
c/o Extension Office
Court House
West Union, Ohio 45693

Agri-Urban, Inc.
222 South Sycamore Street
P. O. Box 117
Lebanon, Ohio 45036

All Ohio Chapter, Soil Conservation
Society of America
124 Parkview Avenue
Circleville, Ohio 43133
Mr. Paul B. Hoskins, President
(614) 474-6516

American Association of Agricultural
College Editors (AAACE)
c/o James Chapman, Coordinator
2120 Fyffe Road
Columbus, Ohio 43210
(614) 422-2011

American Association of University
Women
1050 East Cooke Road
Columbus, Ohio 43224
Ms. Marie Pheiffer

American Association of Veterinary
Ophthalmologists
P. O. Box 4261
Copley, Ohio 44321
Charles J. Parshall, Jr., DVM
Secretary
(216) 666-5315

American Camping Association
Ohio Section
P. O. Box 105
Chagrin Falls, Ohio 44022
Mrs. Helen N. Bradburn
Executive Secretary
(216) 543-9435

American Dairy Association of Ohio
110 South Court Street
Marysville, Ohio 43040
Earl B. Poling, General Manager

American Jersey Cattle Club
2105 S. Hamilton
Columbus, Ohio 43227
(614) 861-3636

American Legion, Department of
Conservation
4060 Indianola Avenue
Columbus, Ohio 43214
Mr. Al Brick
(614) 268-7072

American Society of Agricultural
Engineers
2950 Niles Road
St. Joseph, Missouri 49085
J. L. Butt
Executive Vice President

American Society of Landscape
Architects, Ohio Chapter
3678 Heekin Avenue
Cincinnati, Ohio 45226
Mr. Gary W. Meisner, President
(513) 321-7700

American Society of Landscape
Architects, Ohio Chapter
129 South Main Street
North Canton, Ohio 44720
Thomas Bonnell, President
(216) 499-9944

Association of Ohio Garden Clubs
201 Beech Street
Doylestown, Ohio 44230
Mrs. James Pond
(216) 658-2948

Aullwood Audobon Center and Farm
1000 Aullwood Road
Dayton, Ohio 45414
Mr. Jack Wood
(513) 890-7360

Beaver Creek Protection Association
20273 Portage Road
Weston, Ohio 43569
Mr. Floyd Williams, President
(419) 669-2840

Belle Valley Area
16714 State Route 215
Caldwell, Ohio 43724
(614) 732-2381

Bob Evans Farms
Box 330
Rio Grande, Ohio 45624
Farm Director
(614) 245-5325

Bread for the World
5th Congressional District Coordinator
Valerie Myers
1727A E. McPherson
Clyde, Ohio 43410

Bruckner Nature Center
5995 Horseshoe Bend Road
Troy, Ohio 45373
Mr. Robert F. Heidelberg
Director
(513) 698-6493

Burroughs Nature Club
9224 Sperry Road
Kirtland, Ohio 44060
Mr. Thomas Yates, President
(216) 256-3746

Carroll County Dairy Association
Court House
Carrollton, Ohio 44615

Central Ohio Cooperative Milk Producers, Inc.
Marietta-Athens Division
1035 Greene Street
Marietta, Ohio 45750

Cincinnati Cooperative Milk Sales Association, Inc.
1887 Central Parkway
Cincinnati, Ohio 45214

Cincinnati Museum of Natural History
1720 Gilbert Avenue
Cincinnati, Ohio 45202
Mr. DeVere Burt, Director
(513) 621-3889

Cincinnati Nature Center
4949 Tealtown Road
Milford, Ohio 45150
Mr. John Oney, Director
(513) 831-1711

Cincinnati Produce Growers Association
2 Plum Street
Cincinnati, Ohio 45202

Clergy & Laity Concerned (CALC)
Aggie Hoskins
1736 Superior Avenue
Cleveland, Ohio 44114
(216) 566-0498

The Cleveland Greenhouse Vegetable Growers Cooperative Association
19120 Detroit Road
Cleveland, Ohio 44116

Cleveland Growers Marketing Company
3800 Orange Avenue
Cleveland, Ohio 44115

Cleveland Health Education Museum
8911 Euclid Avenue
Cleveland, Ohio 44106
(216) 231-5010

Columbia Sheep Breeders Association of America
P. O. Box 272, State Route 182
Upper Sandusky, Ohio 43351
Richard L. Gerber
Executive Secretary
(614) 482-2608

Columbus Fruit and Vegetable Cooperative Association
4561 East Fifth Avenue
Columbus, Ohio 43219

Committee for a Country Common
405 Corry Street
Yellow Spring, Ohio 45387
Mr. Ralph Ramey
(513) 767-7375

Consumer League of Ohio
c/o Dorothy Austin
Executive Secretary
940 Engineers Building
Cleveland, Ohio 44114
(216) 621-1175

Cooperative Extension Service
Ohio State University
Columbus, Ohio 43210

CROP; Community Hunger Appeal
of Church World Service
4256 North High Street
Columbus, Ohio 43214
Margaret Brugler, State Director
(614) 261-7183

Crosby Gardens and Library
5403 Elmer Drive
Toledo, Ohio 43615
Ms. Susan LeCron
Executive Director
(419) 536-8365

Dairy and Nutrition Council
Council - Mid East
3363 Tremont Road
Columbus, Ohio 43201
(614) 451-2864

Darby Creek Association
2199 Amity Road
Hilliard, Ohio 43026
Mrs. L. D. Boggs, President
(614) 878-3786

The Dawes Arboretum
7770 Jackstontown Road, S.E.
Newark, Ohio 43055
Mr. Joseph White, Director
(614) 235-2355

Delphos Project Recycle
638 East Seventh Street
Delphos, Ohio 45833
Mr. Fred A. Ruen
(419) 692-6303

Distillers Feed Research Council
Lawrence E. Carpenter, PhD
Executive Director
1435 Enquirer Building
Cincinnati, Ohio 45202
(513) 621-5985

Eastern Order Buying Company
1561 Leonard Avenue
Columbus, Ohio 43203

Farm Labor Organizing Committee
714 South St. Clair
Toledo, Ohio 43601
Baldemar Velasquez, President
(419) 243-3456

Farm Markets of Ohio
35 East Chestnut Street
Columbus, Ohio 43215
(614) 225-8949

Farm and Power Equipment
Retailers of Ohio
6124 Avery Road
Columbus, Ohio 43214
Bill Davidson
Executive Director
(614) 889-1309

Farmers Political Action Committee
16 East Broad Street
Columbus, Ohio 43215
John Wettstein, Secretary-Treasurer

Federal Milk Marketing
Administrative Order 33
5908 Sharon Woods Boulevard
Columbus, Ohio 43229
(614) 891-1851

Federation of Ohio River Cooperative
320 Outerbelt Drive, Suite D
Columbus, Ohio 43213
(614) 861-2446

4-H Camp Ohio
11461 Camp Ohio Road
St. Louisville, Ohio 43071
Mr. Dave Hoy
(614) 745-2194

Friends of the Earth
Route 1
South Bloomingdale, Ohio 43152
Ed Grant, Branch Representative
(614) 887-4793

Fremont Beet Growers Association
1401 Walter Avenue
Fremont, Ohio 43420

Fremont Pickle and Tomato
Growers Association
1401 Walter Avenue
Fremont, Ohio 43420

Fruit Growers Marketing Coop
Newcomerstown, Ohio 43832

Garden Clubs of Ohio, Inc.
3826 Chevington Road
Columbus, Ohio 43220
Mrs. Harold Bird, Jr., President
(614) 451-1875

Grape Growers Cooperative
Association, Inc.
34402 Chester Road
Avon, Ohio 44011

Greenhouse Vegetable Packing
Company
430 West Bagley Road
Berea, Ohio 44017

Grove City Farmers Exchange
7366 London Street
Derby, Ohio 43117

Guernsey-Noble Feeder Cattle
Production Association
Route 4
Cambridge, Ohio 43725
Oscar Share

Hamilton County Vegetable
Growers' Association, Inc.
Cincinnati, Ohio 45202

Hunger Network
299 King Avenue
Columbus, Ohio 43215
(614) 424-6203

Hunger Task Force
65 South Fourth Street
Columbus, Ohio 43215
(614) 464-1956

Independent Livestock Marketing
Association
P. O. Box 5824
Columbus, Ohio 43221
Roger L. Connor, Secretary
(614) 486-9060

Institute for Environmental Education
8911 Euclid Avenue
Cleveland, Ohio 44114
Mr. Joseph H. Chadbourne
(216) 791-1775

Institute for Future Studies
and Research
166 Fir Hill
Akron, Ohio 44325
(216) 375-7887
Dr. Gary Gappert, Director

International Society of
Arboriculture
1877 Snouffer Road
Worthington, Ohio 43085
Dr. T. Davis Sydnor
Executive Secretary
(614) 846-4621

Izaak Walton League
P. O. Box 724
Tiffin, Ohio 44883
Mr. Edward W. Schekelhoff
Executive Director
(419) 447-7716

Joy Resident Education Center
Box 177
Clarksville, Ohio 45113
Mr. Gene Knight
(513) 289-2031

Kent Environmental Council
156 South Water Street
Kent, Ohio 44240
Ms. Ruth Meade, Secretary
(216) 673-4079

Lake Shore Erosion Committee
36681 Lake Shore Boulevard
Eastlake, Ohio 44094
Mrs. Chauncey Grantz
(216) 942-7798

Landmark, Inc.
P. O. Box 479
Columbus, Ohio 43216
(614) 225-8923

League of Women Voters of Ohio
65 South Fourth Street
Columbus, Ohio 43215
(614) 469-1505

Little Miami, Inc.
3012 Section Road
Cincinnati, Ohio 45237
Mr. Thomas L. Behan, Director
(513) 351-6400

Lutheran Memorial Camp
Box 8
Fulton, Ohio 43321
Ms. Robin McCullough

Miami Valley Milk Producers
Association
Greenville, Ohio 45331

Mid-States Terminals, Inc.
1235 Miami Street
Toledo, Ohio 43605

Mid-States Wool Growers
Association
3900 Groves Road
P. O. Box 26068
Columbus, Ohio 43227
Paul A. Getz, Secretary
(614) 861-2533

Mid-Wood, Inc.
P. O. Box 317
East Gypsy Lane Road
Bowling Green, Ohio 43402

Milk, Inc.
Toledo Division
210 North Westwood
Toledo, Ohio 43607

Milk Marketing, Inc.
519 East 11th Avenue
Columbus, Ohio 43211
(614) 294-2601

Mohican School in the Out of Doors
Route L-2, Box 287
Loudonville, Ohio 44842
Mr. Ron Reed, Director
(419) 994-3201

National Association of Greenhouse
Vegetable Growers
R. A. Gall Building
6500 Pearl Road
Cleveland, Ohio 44130

National Association of Supervisors
of Agricultural Education
c/o James E. Dugan
Room 910, 65 South Front Street
Columbus, Ohio 43215
(614) 466-3076

National Drive-In Fast Food and
Soft Ice Cream Association
14627 Watt Road
Novelty, Ohio 44072
c/o Harry J. Kimpel
Executive Secretary
(216) 338-5588

National Farmers Organization
Route 1
Mount Sterling, Ohio 43143
Mildred Davis, Secretary
(614) 869-2278

National Farmers Union
(See Ohio Farmers Union)

National Forest Products Association
41 Croswell Road
Columbus, Ohio 43214
Michael M. Westfall
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(614) 268-1436

Northeastern Ohio Growers
Cooperative
Chesterland, Ohio 44026

Northwestern Ohio Corn Hybrid
Association
Route 3
Delta, Ohio 43515

Ohio Agricultural Marketing
Association
35 Chestnut Street
P. O. Box 479
Columbus, Ohio 43216

Ohio Agricultural Marketing
Association
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35 East Chestnut
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Ohio Agricultural Research and
Development Center
Wooster, Ohio 44691
(216) 262-8176

Ohio Alfalfa Export Corporation
2404 Summit Street
Toledo, Ohio 43611
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Secretary-Treasurer
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Ohio Alliance for Environmental
Education
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Columbus, Ohio 43201
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Ohio Apple Institute
P. O. Box 666
New Philadelphia, Ohio 44663
Norman M. Witherspoon, Manager
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Ohio Association of County
Agricultural Agents
c/o Glenn Maddy
1401 Walter Avenue
Fremont, Ohio 43420
(419) 332-4318

Ohio Association of Garden Clubs, Inc.
Route 2
Warsaw, Ohio 43844
Mrs. Quenton Elder, President
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Ohio Ayrshire Club
Route 1
De Graff, Ohio 43318
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Ohio Bakers Association
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Columbus, Ohio 43215
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Ohio Beef Marketing Program
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Worthington, Ohio 43085
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Ohio Canners & Food Processors Association
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Ohio Cattlemen's Association
c/o Dan L. Davis
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Logan, Ohio 43138
(614) 385-2500

Ohio Christmas Tree Growers, Inc.
7808 Diagonal Road
Kent, Ohio 44240

Ohio Coal and Energy Association
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Columbus, Ohio 43215
Mr. James Trapp
(614) 224-0407

Ohio Conservation Congress
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New Philadelphia, Ohio 44663
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Ohio Conservation and Outdoor Education Association
621 Mount Vernon Road
Newark, Ohio 43055
Mr. Len Feightner
(614) 366-4741

Ohio Conservation and Outdoor Education Association
Division of Environmental Education
Ohio State University
Lewis Lane
Newark, Ohio 43055
Lillabelle Holt, Secretary
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Ohio Conservation Foundation
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Cleveland, Ohio 44114
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Ohio Cooperative Extension Agents Association
110 Cottage Street
Ashland, Ohio 44805
Calvin D. Knight
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Ohio Crop Reporting Service
Room 608 Federal Building
200 North High Street
Columbus, Ohio 43215
(614) 469-5590

Ohio Dairy Products Association, Inc.
1429 King Avenue
Columbus, Ohio 43212
(614) 486-6000

Ohio Dairymen's Association, Inc.
625 Stadium Drive
Columbus, Ohio 43210
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Ohio Department of Agriculture Consumer Information Center
Room 701, 65 South Front Street
Columbus, Ohio 43215
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Ohio Ecological Food and Farm
Association
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Mount Perry, Ohio 43760
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Ohio Farm Bureau Federation
35 East Chestnut Street
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Columbus, Ohio 43216
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Ohio Farm and Rural Vacation
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Route 1
Zanesfield, Ohio 43360
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The Ohio Farmers Grain Corporation
New Weston, Ohio 45348

The Ohio Farmers Grain and
Supply Association
550 West Fourth Street, Box 351
Fostoria, Ohio 44830

Ohio Farmers Union
1011 North Defiance Avenue
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Ottawa, Ohio 45875
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Ohio Federation of Soil and Water
Conservation Districts
Fountain Square, Building A
Columbus, Ohio 43224
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Ohio Fertilizer and Pesticide
Association
P. O. Box 151
Worthington, Ohio 43085
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Ohio Flying Farmers
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Barbara Leis
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Ohio Future Farmers of America
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65 South Front Street
Columbus, Ohio 43215
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(614) 466-3076

Ohio Geological Society
Box 14322
Columbus, Ohio 43214
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Ohio Grain, Feed and Fertilizer
Association, Inc.
6877 North High Street
Columbus, Ohio 43210
(614) 885-4429

Ohio Greenhouse Co-op Association
R. A. Gall Building
6500 Pearl Road
Cleveland, Ohio 44130
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Ohio Hospital, Institutional and
Educational Food Service Society
c/o Shirley McGonigal
735 State Mill Road
Akron, Ohio 44319
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Ohio Jersey Breeders Association
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Prospect, Ohio 43342
A. Bud Baird
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(614) 494-2312

Ohio Junior Horticultural
Association
Department of Horticulture
Ohio State University
2001 Fyffe Court
Columbus, Ohio 43210
(614) 442-8326

Ohio Land Improvement Contractors
Association
Box 116, 84 North High Street
Dublin, Ohio 43017
Mr. Larry Trask
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Ohio Licensed Beverage Association
50 West Broad Street, Suite 1031
Columbus, Ohio 43215
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Ohio Milk Producers Federation
519 East 11th Avenue
Columbus, Ohio 43211
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Ohio Natural Foods Associates
252 East Blake Avenue
Columbus, Ohio 43202
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Ohio Nut Growers Association
1807 Lindbergh, NE
Massillon, Ohio 44646
Raymond E. Silvis
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OPIRG, Ohio Public Interest Research
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Ohio Peach Council
245 North High Street
Columbus, Ohio 43216
William McNutt, Secretary
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Ohio Pest Control Association
18319 Nottingham Road
Cleveland, Ohio 44119
William Kirchiner
Secretary-Treasurer

Ohio Pesticide Education Association
245 North High Street
Columbus, Ohio 43216
Paul Slade, Administrative Secretary
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Ohio Pork Producers Council
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Ohio Potato Growers Association
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Columbus, Ohio 43214
David Kelly, Manager
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Ohio Poultry Association
674 West Lane Avenue
Columbus, Ohio 43210
Robert L. Hooker
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Ohio Retail Food Dealers Association
1200 North Main Street
Canton, Ohio 44708
Richard C. Hetherington
Executive Director
(216) 494-2300

Ohio River Basin Commission
36 East Fourth Street, Suite 208
Cincinnati, Ohio 45202
(513) 684-3831

Ohio School Food Service Association
Division of School Food Service
Ohio Department of Education
65 South Front Street
Columbus, Ohio 43215
Robert Koon, Director
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The Ohio Seed Dealers
Association, Inc.
6150 Avery Road, Box 477
Dublin, Ohio 43017

Ohio Seed Improvement Association
6150 Avery
Columbus, Ohio 43221
Roy Becker, Secretary-Manager
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Ohio Society of American Foresters
Fountain Square, C-3
Columbus, Ohio 43224
Mr. Lawrence J. Eklers, Ed.
(614) 466-7842

Ohio Soft Drink Association
230 East Town Street
Columbus, Ohio 43215
Norton R. Webster
Executive Secretary and Counsel
(614) 228-2945

Ohio State Grange
1031 East Broad Street
Columbus, Ohio 43205
Mr. James Ross, Master
(614) 258-9569

Ohio State Horticultural Society
245 North High Street
Columbus, Ohio 43216
William McNutt
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Ohio Swine Breeders & Feeders
Association
Route 1
Fredericktown, Ohio 43019
J. William Moody, President

Ohio Trucking Association
50 West Broad Street
Columbus, Ohio 43215
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Ohio Valley Egg Cooperative
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Milford, Ohio 45150
(513) 831-3470

Ohio Valley Improvement
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One Lytle Place
621 Mehring Way, Suite 507
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Ohio Vegetable & Potato Growers
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35 East Chestnut
Columbus, Ohio 43216
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Ohio Vocational Agriculture
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65 South Front Street, Room 910
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Ohio Warehousemen's Association
5090 Thornhill Lane
Columbus, Ohio 43220
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P. E. A. C. E.
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Mr. George K. Richards
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Pioneer Company
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Columbus, Ohio 43216

Potato Chips and Snack Food
Association
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Euclid, Ohio 44132
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Producers Livestock Association
5909 Cleveland
Columbus, Ohio 43227
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Professional Land Surveyors
of Ohio
7653 Foxboro Court
Columbus, Ohio 43206
Charles Coutellier
Executive Director
(614) 889-7505

Rivers Unlimited
French Park
3012 Section Road
Cincinnati, Ohio 45237
Mr. L. H. Fremont
(513) 851-1500

Rural Life Ministry
Diocese of Toledo
1550 Clough Street #6
Bowling Green, Ohio 43402
Susan Raftery
(419) 354-2049

Rural Resources
5115 Wooden Shoe Avenue
Cincinnati, Ohio 45232
David Rosenberg
(513) 681-4574

Rural Service, Inc.
2025 West State Street
Fremont, Ohio 43420

The Rurban Project
3800 Bridge Avenue
Cleveland, Ohio 44113
Reverend Charles Frye
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Salem Fruit Growers Cooperative
Association
Box 3
Greenford, Ohio 44422

Sandusky Cooperative Milk
Producers Association
Route 1
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Shaker Lakes Regional Nature
Center
2600 South Park Boulevard
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Mr. Richard A. Horton
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Southcentral Ohio Preservation
Society
P. O. Box 6
Piketon, Ohio 45601
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Southeastern Ohio Beef Cattle
Improvement Association
Gallipolis, Ohio 45631

Southeastern Ohio Farmers Co-op
1186 3rd Street
Bidwell, Ohio 45614

Sun Project PSC
247 West North Street
Wooster, Ohio 44691
Marty Bowman
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Toledo Gardeners Cooperative
Association
30 North Huron Street
Toledo, Ohio 43604

Tri-County Producers Co-op
Route 2
Beloit, Ohio 44609

Trust for Public Land, Ohio
Field Office
401 Euclid Avenue, No. 342
Cleveland, Ohio 44114
Mr. Thomas W. Offutt, III
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United Church of Christ,
Ohio Conference
Hunger Task Force
41 Crosswell
Columbus, Ohio 43215
Marge Ramp, Chair

Utica Concerned Citizens
17060 Vance Road
Utica, Ohio 43080
Mr. Ron Branstool
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Wildlife Legislative Fund
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Columbus, Ohio 43215
Mr. Thomas B. Addis
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Alexandria, Ohio 43001
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Woodland Altars
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Wooster Egg Producers, Inc.
Box 457
Wooster, Ohio 44691

Y.M.C.A. Camp Campbell Gard
4803 Augspurger
Hamilton, Ohio 45011
Terry Carroll
(513) 867-0600

Y.M.C.A. Camp Kern
Box 5291, State Route 350
Oregonia, Ohio 45054
(513) 932-3756

ABOUT THE CORNUCOPIA PROJECT...

The Cornucopia Project of Rodale Press, Inc., has as its goals, first, to document where the U.S. food system is vulnerable, and second, to suggest how the system could be transformed to sustain and conserve our resources. For more information, contact The Cornucopia Project, Rodale Press, 33 East Minor Street, Emmaus, Pennsylvania 18049. (215) 967-5171.

ABOUT RURAL RESOURCES...

Based in the Ohio, Kentucky, Indiana Tri-State area, Rural Resources, Inc. is a non-profit education and advocacy organization concerned with food, farm and land use issues. Projects of Rural Resources include establishment of the Cincinnati Tailgate Marketing Project, Cincinnati Community Gardens, the Ohio Ecological Food and Farm Association and the East Central Cornucopia Alliance. For more information, write Rural Resources, 11 Interwood Place, Cincinnati, Ohio 45220. (513) 481-0016.

ABOUT THE EAST CENTRAL CORNUCOPIA ALLIANCE...

The East Central Cornucopia Alliance is a network of organizations and individuals in Illinois, Indiana, Kentucky, Michigan and Ohio who have joined together to promote the ideal and work for the reality of a secure food system in this region. Its goal is to develop and see implemented a food plan for each of the states in this region. For more information, contact Rebecca E. McDowell, ECCA Coordinator, Route 2, Box 40A, Cloverdale, Ohio 45827. (419) 596-4641.

C8111-1.12

Ohio Food Production and Consumption

		FLOW		PRODUCTION (1,000's)			CONSUMPTION (1,000's)			RETAIL DOLLARS (in 1,000's of 1981 $)		ACREAGE
	State's Production Rank[a]	% Imported[b]	% Exported[c]	Pounds Farm Wt.[d]	Pounds Retail Weight[e]	1981 Retail Dollars[f]	Pounds Farm Weight[g]	Pounds Retail Weight[h]	1981 Retail Dollars[i]	Imports[j]	Exports[k]	Land Required To Produce 100% of Ohio Consumption[l]
MEATS												
Beef/Veal	22[m]	69		358,356[n]	259,104	681,444	1,135,888[n]	859,441	2,260,330	1,599,628		5,328,534[o]
Lamb & Mutton	11	29		11,562	10,020	32,966	16,196	14,037	53,285	15,453		4,153[p]
Pork	10	39		483,351[q]	449,981	755,968	792,531	737,464	1,238,940	483,187		705,948[r]
Lard			55	62,080	69,692	47,155	28,073	26,993	21,324		25,831	
POULTRY												
Chicken	25[s]	93		55,290[t]	39,809	29,458	749,819[u]	539,871	399,505	371,540		271,020
Eggs	10	21		305,234[v]	304,625	147,776	384,388	373,576	180,839	37,976		159,050
Turkey	16	65		50,112[w]	40,090	39,238	141,716	113,369	111,102	72,216		85,886
FISH		99.9		330[x]	198	505	228,545	137,127	349,674	349,324		NA
DAIRY												
Butter	8	43		27,028[y]	27,028	53,515	47,509	47,509	94,068	40,[illegible]		167,285
Cheese, Cottage	3		62	127,269[z]	127,269	108,179[aa]	48,588	48,588	41,[illegible]		67,071	
Cheese, Others	8	5		95,166	95,166	288,353	190,035	190,035	723,000	361,506		397,690
Ice Cream	4		15	220,590	220,590	194,119	186,795	186,795	244,185		29,118	118,077
Ice Milk & Sherbert	26		23	118,430	118,430	70,335	90,698	90,698	54,549		16,177	
Milk, fluid & cream	7		12	4,270,000[bb]	4,270,000	1,024,800	2,461,812	2,461,716	540,812		430,416	410,354
Milk, evap & cond.			42	132,056	132,056	84,516	76,662	76,612	49,032		35,497	28,343
Milk, non-fat, dry			[illegible]	38,[illegible]	38,087	66,652	34,551	34,551	60,46[illegible]		5,999	53,567
GRAINS[cc]												
Barley: Human	30	96		479[cc]	477[dd]	377	18,356[dd]	18,295[dd]	14,453	13,875		7,354
Livestock				(19,489)								
Corn: Human	5		51	2,406,222	1,780,603	1,317,646	1,176,919	737,464	545,723		671,999	185,968
Livestock				(22,272,978)								
Oats: Human	[illegible]	29		49,741	23,723	16,978	70,183	33,472	26,778	7,766		31,332
Livestock				(572,019)								
Popcorn	4		49	50,820	44,480	23,130	25,914	25,913	13,475		11,334	7,853
Rice		100		0	0	0	100,416	100,416	65,270	65,270		NA
Rye: Human	16	82		1,985	1,544	494	9,718	7,558	2,419	1,984		5,258
Livestock				(10,951)								
Soybeans: Human	6		35	139,692	139,692	192,775	21,595	21,595	15,761		163,859	9,998
Livestock				(6,844,884)								
Wheat: Hard (bread, etc)	11	100		0	0	0	1,720,0[illegible]	979,127	274,156	274,156		333,036[ff]
Soft red winter (pastry, etc)	1		91	4,027,800	3,100,499	775,125		344,903	96,574		705,364	117,316
VEGETABLE OIL												
Margarine								120,926	84,648			
Oils (soy)			24	321,206	321,206	411,144	245,092	245,092	313,718		97,426	
Shortening								197,585	150,165			
VEGETABLES[ee]												
Artichokes		100		0	0	0	3,239	3,239	3,207	3,207		NA
Asparagus												
Fresh		98		174[ff]	174	501	3,239	3,239	6,446	6,317		2,699
Canned[gg]		100		0	0	0	3,952[ee]	3,239[ee]	4,114	4,114		3,292
Frozen		100		0	0	0	1,242[ee]	648[ee]	1,866	1,866		659
Beans, Dry Edible		99	-	803	803	538	70,183	70,181	47,021	46,551		52,768
Beans, Lima												
Canned		44		1,136	1,817	1,381	2,025	3,239	2,462	1,083		991
Frozen		100		0	0	0	5,329	5,075	7,054	7,054		2,645
Beans, Snap												
Fresh		84		2,400	2,400	1,272	15,116	14,036	7,439	6,174		4,010
Canned		100		0	0	0	47,660	66,941	30,123	30,123		13,617
Frozen		100		0	0	0	12,741	10,797	10,365	10,365		4,112
Broccoli												
Fresh		99.6		143[ff]	143	99	19,435	18,356	12,666	12,615		2,447
Frozen		100		0	0	0	20,105	15,116	16,930	16,930		2,419
Cabbage	11											
Fresh		65		34,300	27,000	9,720	91,177	90,698	32,651	21,223		4,180
Sauerkraut[gg]	3		5	54,000	53,820	26,372	24,087	12,956	6,348		14,505	492
Carrots												
Fresh		41		40,336	40,336	17,748	68,024	65,662	28,979	11,881		2,803
Canned		100		0	0	0	7,196	5,399	2,537	2,537		306
Frozen		100		0	0	0	18,248	10,041	8,234	8,234		712
Brussels Sprouts												
Frozen		100		0	0	0	3,590	2,699	3,023	3,023		240
Cauliflower												
Fresh		100		0	0	0	15,116	14,037	2,807	2,807		2,807
Frozen		89		750	750	150	7,103	4,967	7,600	6,764		1,192
Celery												
Fresh		80		17,200	17,200	8,600	84,220	78,818	39,409	31,527		1,609
Corn, Sweet	4											
Fresh		68		24,955	22,875	4,804	77,741	71,260	14,965	10,176		9,501
Canned		68		46,655	20,995	9,447	146,089	62,625	28,180	19,162		20,870[jj]
Frozen		52		36,890	9,970	10,468	77,104	20,838	21,880	11,378		11,015[jj]
Cucumbers												
Fresh		100		0	0	0	46,427	43,188	23,753	23,753		1,661
Pickles[gg]	3		56	125,060	125,060	106,301	55,430	74,499	63,324		59,529	2,704
Eggplant												
Fresh		87		820	820	566	6,478	5,399	3,725	3,241		360
Escarole/Endive	3		16	7,700	7,700	5,180	6,478	6,478	4,470		829	418
Garlic		99.3		77	77	230	10,797	8,638	25,828	25,647		664
Lettuce	12	97		8,100	8,100	4,050	289,371	268,845	134,422	130,389		24,440
Mushrooms		67		8,908	8,908	15,945	26,943[hh]	26,993	48,317	32,372		NA
Onions, Green				9,323			NC					
Frozen		100		0	0	0	14,684	7,342	8,003	8,003		471
Storage, Fresh		86		16,700	15,100	5,134	116,612	110,129	37,444	32,202		2,936
Peas, Dry Field		100		0	0	0	4,319	4,318	2,116	2,116		1,775
Peas, Green												
Canned		99.4		158	158	14[illegible]	26,332	35,630	16,034	15,938		7,836
Frozen		100		0	0	0	18,125	16,627	17,458	17,458		5,809
Peppers, Green		87		4,900	4,900	5,145	38,871	35,630	37,412	32,548		4,192
Potatoes												
Fresh		60		223,400	223,400	51,382	554,987	547,407	125,903	75,512		24,666
Processed		100		0	0	0	695,354	259,138	101,621	101,621		18,004
Pumpkin/Squash[ii]					NC	NC	4,319	4,319	2,721			487
Spinach												
Fresh		82		1,516	1,516	894	8,638	7,558	4,459	3,656		967
Processed		100		0	0	0	16,444	13,497	6,305	6,305		1,658
Sweet Potatoes												
Fresh		99.6		144	144	63	41,030	36,710	16,152	16,087		2,409
Processed		100		0	0	0	14,037	10,797	4,103	4,103		915
Tomatoes												
Fresh		94		9,100	9,100	6,552	144,685	123,091	83,957	78,920		9,043
Processed[kk]	2	28		504,000	504,000	236,880	695,339[kk]	239,694	138,439	38,763		23,178
FRUITS[ll]												
Apples: Fresh	[illegible]	44		170,000	105,000	54,600	180,317	172,752	89,831	39,526		12,380
Processed							123,846	82,492				
Apricots		100		1	0		8,778					NA
Avocados		100		0	0	0	8,638					NA
Bananas		100		0	0	0	224,586	224,578	78,602	78,602		NA
Berries, Black, Blue, & Rasp: Fresh							3,938					1,641[mm]
Processed		85		601								NA
Cranberries: Fresh		100		0	0	0	1,080					
Processed				0	0	0	2,915					
Strawberries: Fresh	5	49		10,500	8,300	6,557	20,515	18,355	14,500	7,105		2,931
Processed							13,454					1,922
Cherries: Fresh		98		387	332	379	7,558	6,478	6,348	6,221		6,763
Processed							14,330					
Citrus (all): Fresh		100		0	0	0	309,886	300,157	141,074	141,074		NA
Processed						0	449,281					NA
Dates & Figs		100		0	0		9,718					NA
Grapes: Fresh[nn]	7	46		23,400	24,000	21,120	43,190	38,869	34,205	15,734		8,543
Processed							83,421					
Melons:												
Cantaloup & Honeydew		81		14,955	14,955	5,533	77,741	71,263	25,416			13,034
Watermelon		98		2,265	2,265	430	123,091	111,213				
Olives		100		0			8,638					NA
Peaches & Nectarines	20											
Fresh		90		12,000	12,000	4,200	78,821	75,579	26,453	23,808		9,488
Processed							44,269					5,558
Pears: Fresh		96		1,651	1,651	941	26,994	25,913	14,770	14,179		3,727
Processed				0	0		20,137					2,896
Pineapple & Papaya		100		0	0		122,260					NA
Prunes/Plums: Fresh		99		640	640	346	17,276	16,196	8,746	8,659		2,478
Processed		100		0			34,768					5,327
SWEETS, SPICES, NUTS & OTHER												
Cocoa		100		0	0	0	28,073					NA
Coffee & Tea		100		0	0	0	92,858	120,926	466,774	466,774		NA
Herbs & Spices		100		0	0	0	17,276	17,276	269,857[oo]	269,857		
Honey	23	81		2,460	2,460	3,665	12,957	12,956	19,304	15,636		NA
Maple Syrup	4	10		971	971	3,107	1,080	1,079	3,500	350		
Peanuts		100		0	0	0	65,864	65,862	108,014	108,014		NA
Sugar Beets	11	89		678,000	101,700[pp]	28,476[qq]	6,017,762[pp]	902,664	252,746[qq]	224,270		157,533
Tree Nuts		99.8		39	39	62	18,356	18,355	29,184	29,126		
TOTALS				15,450,404	12,985,948	7,02[illegible],677	21,975,861	13,593,929	10,917,145	6,027,004	2,234,954	8,942,243

①

APPENDIX I

NOTES:

a. Unless otherwise noted, Ohio production ranking among States by commodity was taken from Ohio Agricultural Statistics - 1980, (Columbus: Ohio Crop Reporting Service, 1981), pp. 51-52.

b. The percentage imported was determined by subtracting the production divided by consumption figure from 1.00.

c. The percentage exported was calculated using the formula: production minus consumption divided by production.

d. 1980 production figures were used whenever possible generally from Ohio Agricultural Statistics - 1980, Agricultural Statistics 1980, (Washington: USDA, 1980) or 1978 Census of Agriculture (Washington: U.S. Dept. of Commerce, 1981) Vol. I, Part 35 (AC 78-A35).

e. Dr. Vern Harnapp, Associate Professor of Geography, University of Akron, and student assistants gathered the data for this column, with a few exceptions. Agricultural Statistics 1980 (Washington: USDA, 1980) was the primary source.

f. Dr. Vern Harnapp and student assistants gathered per pound retail prices in the Akron, Ohio area at Kroger, Sparkle and Acme supermarkets. "In order to even out seasonal fluctuations and specials, surveys of shelf prices were taken three times -- winter, spring and late summer, 1981."

g. 1980 national per capita consumption data were taken from Food Consumption, Prices and Expenditures; 1960-1980 (Washington: USDA, 1981) Statistical Bulletin Number 672 from The Economic Research Service. The per capita figures were multiplied by Ohio's 1980 population of 10,797,419 to obtain the figures for this column. When farm weight consumption was not given, conversion from retail to farm weight equivalent was accomplished using tables in Conversion Factors and Weights and Measures for Agricultural Commodities and their Products (Washington: USDA, 1979), Economics Statistics and Cooperative Service Statistic Bulletin No. 616.

h. Dr. Vern Harnapp and student assistants used Food Consumption, Prices and Expenditures, 1960-1980 (cited above) times Ohio's 1980 population of 10,797,419 to arrive at the number in this column, with a few exceptions.

i. Dr. Vern Harnapp and student assistants obtained the figures in this column by multiplying the retail weight of Ohio's consumption by the retail cost (per pound) whose derivation is cited in footnote f.

j. The percentage of the commodity imported (see[b]) was multiplied by the retail value of its consumption (see[i]) to determine the data in this column.

k. The percentage of the commodity exported (see[c]) was multiplied by the retail value of its production (see[f]) to determine the data in this column.

l. The acreages required to produce all of Ohio's consumption were determined by Dr. Vern Harnapp and student assistants at the University of Akron using the guidelines set forth in The State of Your Food: A Manual for State Food Systems Analysis (Emmaus, PA: Rodale Press, 1981), pp. 13-21. In the case of the grains, fruits and vegetables this simply involves dividing the farm weight of consumption by the average yield weight per acre.

m. Cattle and calves production rank, Ohio Agricultural Statistics, 1980, p. 51.

n. The farm weight for beef/veal and other meats uses the carcass weight.

o. Using a paper by William Lockeretz, Agricultural Resources Consumed in Beef Production Systems (St. Louis: Washington Univ. Center for the Biology of National Systems, 1975), Indiana data indicate that .17 acres of land is used for corn and silage, plus .45 acres of intensive pasture or hay to produce 100 pounds of (retail weight) beef.

p. Raising a Small Flock of Sheep (Washington: USDA, 1977), Farmers Bulletin #2222 was used to calculate the acreage.

q. Pork production live weight of 692,729 was multiplied by .65 to get 449,981 lbs. retail weight. Since 73.4 lbs of carcus weight equals 68.3 lbs of retail weight (Food Consumption, Prices and Expenditures, p. 6) carcass production equals 449,981 x 73.4 ÷ 68.3 = 483,351.

r. Pork consumption land requirements are derived from 16 bushels of corn required to produce a 225 pound hog (live weight) The State of Your Food, p. 18

s. Chicken rank is based on broiler production, Ohio Agricultural Statistics, 1980, p. 51 (hereinafter O.A.S.)

t. This is live weight broiler production in 1980, O.A.S.

u. Live weight equivalent for consumption.

v. The O.A.S. figure of 2,333 million eggs was divided by 12 and multiplied by 1.57 (lbs/doz, Food Consumption etc., p. 8) to obtain poundage.

w. Live weight

x. 1978 Census of Agriculture, V.I Part 35, p. 16 lists fish sales of 62,009 lbs of catfish and 267,661 pounds of other fish (excluding tropical and bait fish).

y. This and most subsequent dairy production figures come from Ohio Dairy Products, 1980 Annual Report (Columbus: Ohio Crop Reporting Service, 1981). This figure is a preliminary estimate.

z. This cottage cheese figure combines lowfat, creamed and curd figures.

aa. A retail price of $ .85/lb was found at the Continental, Ohio Supervalue, and was used for the retail value calculations.

bb. From O.A.S. production of 4,310 million pounds is deducted 40 million pounds fed to calves

cc. The percentage of grain which is directly consumed by humans was derived using national figures from the National Feed and Grain Association, the American Soybean Association and the Corn Refiners Association. The percentages going to human consumption came out as follows: 2.4% for barley; 9.75% for corn; 8% for oats; 14.7% for rye and 2% for soybeans. These figures exclude grain used in alcohol production.

dd. Food Consumption, Prices and Expenditures lists grain products on pp. 26 & 27, with the per capita consumption in processing level equivalents. Later, on pp. 75-76, it lists grain consumption on a grain equivalent basis. The former was used for retail weight and the latter for farm weight consumption throughout the grain section. The same retail/farm percentage was used to determine retail weights for grain production.

ee. The vegetables, like the fruits that follow, come in different forms and storage modes, each requiring conversion factors to determine farm weight consumption. For example, per capita canned asparagus consumption is 0.3 pounds for 1980 (Food Consumption etc p. 23). Conversion to its farm weight equivalent requires multiplying by 1.22 (Conversion Factors...p. 71). With frozen asparagus consumption of .06 pounds, the conversion factor is 1.92 (same sources).

ff. Production figures for MINOR vegetable crops must usually be assembled from different sources. For example, the 1978 Census of Agriculture shows on page 174 that 158 acres of asparagus were grown commercially in Ohio in 1978. In order to determine yield, Vegetables: 1981 Annual Summary, Acreage, Yield Production, and Value (Washington: USDA, 1981) was used. Page 32 of that source lists yield per acre from the major asparagus producing states, of which Michigan is the closest. Its average yield for 1979-81 was found to be 11 hundredweight (cwt) per acre and this yield was assumed to be the same as Ohio's. 158 acres x 1.1 K lbs/acre = 174 K lbs. Similar procedures were used for most minor vegetables.

gg. Production was usually assumed to be for the fresh market, as no comprehensive statistics are kept on processing once food leaves the farm. When the size of the processing food is large, as in pickles and sauerkraut, figures are available and are given.

hh. Mushrooms, though not a vegetable, had to be placed somewhere. Mushroom consumption was figured by adding the '78 U.S. production of 452,183 K lbs to the 88,312 K lbs of imports (40,051 metric T (Ag Stat., p. 264) x 2.205 (conversion factor) and dividing by the '78 U.S. population of 216,600,000 (Ag. Stat. '80, p. 550) to obtain 2.5 per capita consumption.

ii. While Ohio had 777 acres of pumpkins and 481 acres of squash in 1978 ('78 Census of Ag., p. 176), I've been unable to find any yield statistics so the acreage could be translated into production. Hence the void.

jj. For processed corn the farm weight consumption was divided by 70 cwt (O.A.S., p. 4), Ohio's average yield per acre in order to arrive at the canned and frozen corn acreage requirements.

kk. Rather than list separately canned whole tomatoes, catsup, sauce, paste, pulp, puree and juice, these were combined into processed after appropriate conversion factors translated the retail weight into farm weight.

ll. An additional publication is used in the Fruit section: Non-citrus Fruits and Nuts: 1980 Annual Summary, Production Use, Value (Washington: USDA, 1981) Crop Reporting Board, Economics and Statistics Service, FrNt 1-3 ('81).

mm. An average yield of 24 cwt for blackberries and raspberries was used to figure acreage. This came from a 1976 survey reported in Charles Carter, Homer Carter, Kenneth Ackers, et. al. Ohio's Strawberry, Raspberry, and Blackberry Industry: Potentials and Problems of an Expanding Industry (Wooster: OARDC, 1978), Research Circular 242, p. 7.

nn. Those wishing to know more about Ohio vineyards might read 1976 Ohio Fruit Tree and Vineyard Survey (Columbus: Ohio Crop Reporting Service USDA, 1976).

oo. The retail value of Ohio's consumption was derived from Michigan's figure, Richard Struthers and Rosemary Lewando, The Michigan Food System: Increasing Dependence or Self Reliance? (Emmaus, PA.: Rodale Press, 1982), p. 28.

pp. 15% of sugar beets, by weight, can become refined sugar according to George O. Lof and Allen K. Kreese, The Economics of Water Utilization in the Beet Sugar Industry (Washington: Resources for the Future, 1968,) p. 11. The consumption figures here are for all sugar, beet and cane, and the acreage requirement assumes all sugar would be coming from beets.

qq. A sugar price of 28¢/lb was used for this calculation. Source: Paul's IGA Oakwood Ohio, September '82 special was deemed to be equal to the 1981 regular price.

rr. While hard wheat generally isn't grown in Ohio, for this acreage regional figure, it was assumed that it could be and at Ohio's average wheat (soft) yield of 49 bushels /acre or 2,940 lbs/acre.

Total Retail Value of Ohio Production	7,023,677
Total Retail Value of Ohio Exports	-2,334,954
Value of Remaining Production	$ 4,688,723

Remaining Value	4,668,723
Consumption Value	10,917,145

= 43% of Consumption Produced in Ohio

OHIO IMPORTS 57% of its FOOD

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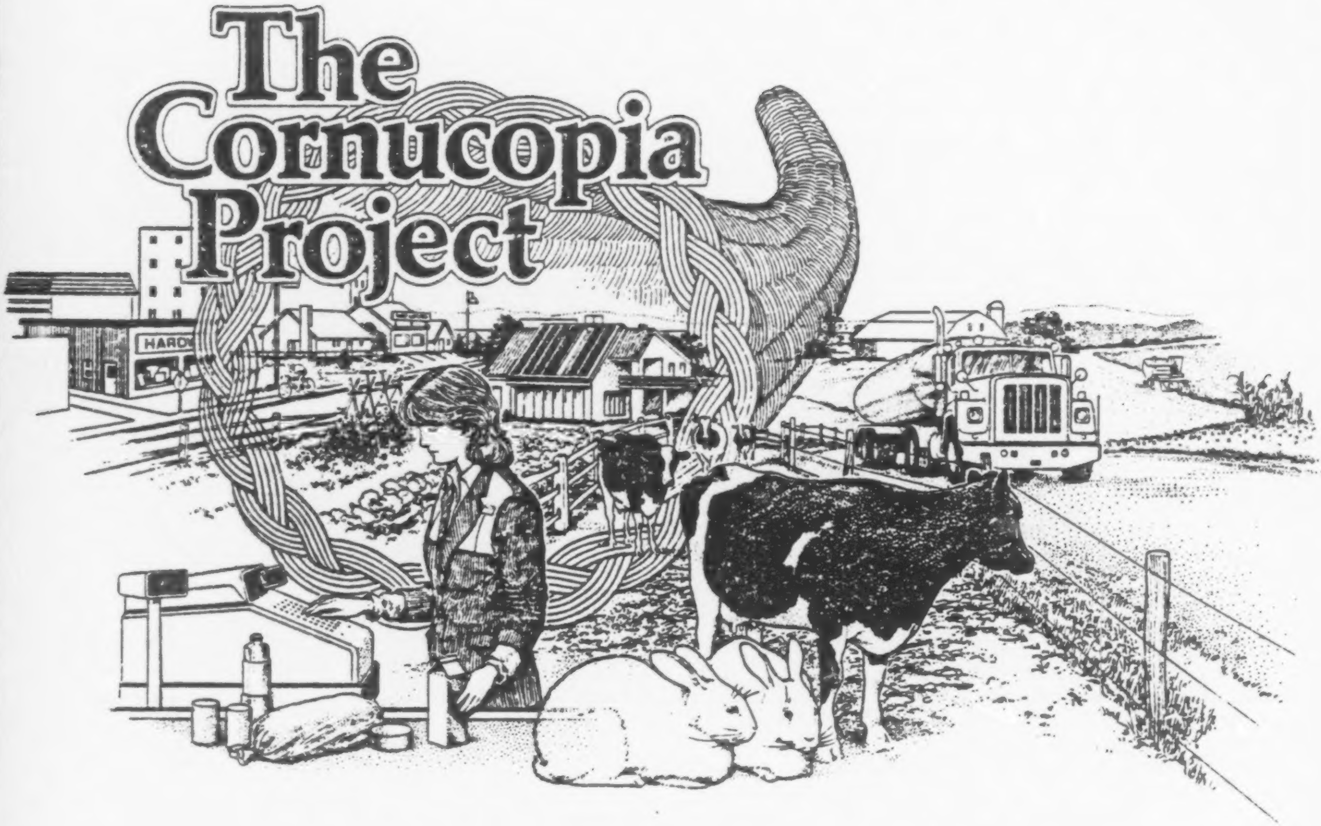

The Massachusetts Food System:

LEADING THE NATION IN VULNERABILITY OR FORGING A PATH TO SELF-RELIANCE?

A study of the food system of Massachusetts by
PETER L. ENGEL
and
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INTRODUCTION

Massachusetts has an agricultural history that extends back over three hundred years, when the Plymouth colonists raised crops for export to England.[1] By the 19th century, Massachusetts farmers raised a wide variety of fruits and vegetables for the urban markets of Boston, New York, and Philadelphia. Onions, asparagus, rhubarb, pickling cucumbers and apples were all important crops that supported a thriving canning industry. Irrigation, cold frames and commercial greenhouses were used to improve and extend the short New England growing season.[2]

By the end of the 19th century, however, Yankee ingenuity and hard work could not compete with the rapidly expanding railway system that brought cheap food and fiber to New England from California, Florida, Kansas, and other states with long growing seasons and deep, fertile soils.

Thus began our dependence on out-of-state sources for our food. The gradual decline in Massachusetts agriculture has had some frightening consequences.

- Massachusetts imports 93 percent of its food.
- Food transportation costs consumers over $1.4 million each day.
- Food export value is $4 billion less than food imports.
- Each year 97 million pounds of fresh vegetables and fruits are damaged or spoiled in transit to Massachusetts.
- We are losing 2 million tons of topsoil to erosion each year -- enough to fill 104,950 semitrailers to capacity.
- Development of our prime farmland continues to exact a heavy toll on our productivity. An area the size of Springfield is lost every 8 months.
- Last year Massachusetts lost 100 farms; in the last 30 years, 16,320 farms have disappeared.

* Last year Massachusetts farm real estate debt rose 13 percent to $101 million. (National average increase was 11 percent.)

* The need for heavy fertilizer application by farmers is highly questionable given a 1981 survey of soil testing labs which showed widely conflicting results on the same soils.

These are symptoms of an unhealthy dependence on a system over which we currently have very little control. Our food is brought to our tables by a complex food system of farmers, harvesters, packers, shippers, processors, wholesalers and retailers. In addition to the efforts of public and private organizations in Massachusetts, many steps can be taken to bolster this food system. This report will address some of the major issues confronting our food system, and will recommend ways of increasing local control of our complex food system.

Our dependence on distant food sources makes us vulnerable to problems and weaknesses in the national system. Energy supplies will probably continue to fluctuate, causing periodic shortages in gasoline that will make it prohibitively expensive to ship lettuce from California or tomatoes from Florida.[3] Natural gas is used to make the ammonia for nitrogen fertilizers. If natural gas prices are decontrolled, nitrogen fertilizers could increase in price from about $200 per ton to nearly $500 per ton.[4] Most of our food is brought to us by truck, which makes our food supply vulnerable to labor disputes or a sudden increase in fuel prices. Then there are the unpredictable events like early frosts, late rains, droughts, and crop blights. We've all seen what heavy rains in California can do to produce prices in Massachusetts.

A strong food and agriculture system will benefit Massachusetts residents in many ways. A regional food system is an insurance policy against the instabilities and weaknesses in the national system. Agriculture is an industry that provides jobs and economic benefit throughout the entire economy. Also, food grown closer to home is fresher and less expensive. Although it will not be easy, the people of Massachusetts can make changes in the structure of the food system. To this end, the recommendations section of the report is tailored for all of us. There are things that the consumer can do as well as the farmer, food industry, researcher, and local and state policymaker. We all are in it together and it is together that we need to work to create the kind of food system that will assure our children and our grandchildren an affordable and secure supply of food.

Food Imports

Considering Massachusett's position as third among the New England states in cash receipts from farm marketings,[5] it is surprising that we must import 93 percent of our food. Although no one may be surprised that we import all of our coffee, tea, oranges, grapefruit, and bananas, it is very surprising how many other foodstuffs we continue to transport into the state which could readily be grown and raised here. While tossing their salads, Massachusetts residents should realize that most of the vegetables come from out-of-state: 94.5 percent of the lettuce, 99.5 percent of the celery, 67.8 percent of the cucumbers, 75.6 percent of the green peppers, and 82 percent of the fresh tomatoes. Few homemakers may know that many of the ingredients stirred in their beef stew have also traveled long distances before reaching the pot: 90 percent of the beef, 88.5 percent of the onions, 82 percent of the carrots, and 79.3 percent of the beans. To top their shortcakes, Massachusetts residents import 85.2 percent of their strawberries.[6] From such diverse states as California, Texas, Florida, and Idaho, 1,086 truckloads of fresh meats, fruits and vegetables roll into this state each week.[7] In a few cases, we even import the very same foodstuffs we export. Take sweet corn. Although last year we exported over 18 million pounds of sweet corn, we also imported 2[illegible] million pounds from as far away as Florida.[8]

Since most of our food has journeyed thousands of miles to reach our plates, that is where 66 percent of our food dollars still go -- outside the state (about 28 percent of our food expenditures go to the Massachusetts retailer).[9] During 1980, Massachusetts residents spent an average $906 per person for food, amounting to a $5.2 billion total food tab. Of this amount, $4.8

billion was spent on food produced outside the state, an average of $600 per person leaving Massachusetts each year to pay for our food. We have a long way to go before we even come close to where our food exports reach the dollar value of our food imports. The present difference is $4 billion.

What do all these numbers mean? To the Massachusetts consumer they dish up some disturbing news.

Our food supply is vulnerable. Because we depend on outside producers for most of our food, our supply is highly uncertain. An oil embargo or energy shortage, a labor dispute, a Med-fly invasion, a drought or crop failure in Florida or California -- any of these could lead to serious shortages. California produces over 40 percent of the nation's fresh fruits and vegetables and close to 54 percent of our processed fruits and vegetables.[10] Any failure along the supply lines of the national food system could have disastrous consequences.

In Massachusetts, a six day transportation disturbance would cause some spot shortages that would rapidly get worse.[11] After a two week halt in transportation, many grocery stores would be empty.[12] Small stores with limited storage facilities would be the first to run out of food. If people knew that a shortage was likely, a "food panic" could empty stores in a day.

These scenarios are not just fantasy. The oil embargo of 1973 had serious effects on food, including higher prices, unavailability of some food products, panic buying, and rationing of the products available.[13] A similar disturbance today would have equally serious consequences. Because of inflation and high interest rates, grocery store, warehouse and food processor back-up inventories are even lower than usual. Winter storm warnings often cause local stores to empty out. If something similar happened on a state-wide scale, many of us would soon be hungry, and we wouldn't last long on the surplus supplies of sweet corn, cranberries and fish produced in the state. If a supply disruption lasted long enough, social order in food-short urban areas could even break down. A serious food shortage in a city could have an effect analogous to yelling "fire" in a crowded theatre.

Transportation costs alone account for over $520 million each year, or $1.4 million each day, of our food bill. The charge for transporting just the fresh vegetables for our salads, stews, and casseroles came to $27 million last year.[14] Clearly we are paying a higher price for our meals than we have to.

Almost 10 percent of the food that is shipped to Massachusetts from around the country never reaches our shopping carts because of waste that occurs in transportation, wholesaling and retailing.[15] Last year, this loss in Massachusetts came to a staggering $43 million for fresh fruits and vegetables alone. In the long journey from grower to consumer, 97 million pounds of fresh fruits and vegetables were spoiled or damaged.

In addition, food that has to travel cross-country must be picked before it is fully ripe, so both its flavor and nutritional value suffer. In short, we end up paying more for food of lesser quality.

Dependence on distant food also means drastic price rises if any problems occur. A study by the U.S. Department of Energy concluded that an energy shortage or reduction of 10 percent in our oil supply would lead to an increase of 55 percent in the price of fresh fruits and vegetables.[16] As energy prices increase, buying foods that are locally produced and processed is going to make good economic sense for Massachusetts consumers.

In addition, our state and local economy is weakened. Keeping more of our food dollars here would strengthen Massachusetts. An economically healthy farming sector increases the strength of the whole region. Every dollar of output from the livestock sector of farming generates $2.78 of total product throughout the economy on its way to final consumption. Every dollar of output from the crop sector generates $1.81 of total product.[17] A strong farming sector not only generates income, but provides jobs for non-farm workers.

Amount of Agricultural Land

A more visible sign that our food system is in trouble is the continued dwindling of the base of our food system -- our agricultural land. Paved over, converted to other land uses, or temporarily removed from productivity and classified as marginal land, our agricultural land (cropland and pastureland) declined by 18 percent between 1967 and 1977. Development and agriculture vie for Massachusetts' 448 thousand acres of prime farmland, 36 percent of which is currently under cultivation.[18] Level, well drained and requiring few conservation measures, prime farmland has always been favored for development. It is, however, a limited resource. Once we build on our prime farmland, agriculture is forced to move to marginal, less productive land. Each year 30,000 more acres of agricultural land are irretrievably lost: an area the size of Springfield is lost to agricultural production every eight months.[19] The 47 square mile area that is lost each year could provide Massachusetts with over 90 percent of our annual fresh,frozen,and canned vegetable consumption.[20] Not included in these figures are the additional acres that are isolated by leap-frog development, and either eventually removed from production altogether or severely inhibited by non-farm activities surrounding them.[21]

Soil Erosion

"For sale" signs on farmland are not the only indications of our diminishing food base. Perhaps more insidious, because less visible and more cumulative, are the yearly losses of 2 million tons of topsoil from cropland, pastureland, and woodland due to sheet and rill erosion. This is enough to cover 1,093 acres of land with a foot of soil every year. Measured another way, enough soil is eroded from Massachusetts farmland each year to fill 104,950 semitrailers to capacity.[22]

Excessive erosion exacts heavy costs on our productive abilities. One acre-foot of eroded soil contains about 8,000 pounds of nitrogen and 2,000 pounds of phosphorus.[23] Through erosion alone, we lose over 8 million pounds of nitrogen and 2 million pounds of phosphorus annually.[24] This represents over $3 million at current fertilizer mineral costs.[25] Each acre-foot of topsoil also stores 2 inches of available water for crops. With our current topsoil losses, we are washing away the capacity to hold over 59 million gallons of water each year,[26] and depleting the soil of its vital moisture retention abilities. Over time these decreases point to lower yields per acre.

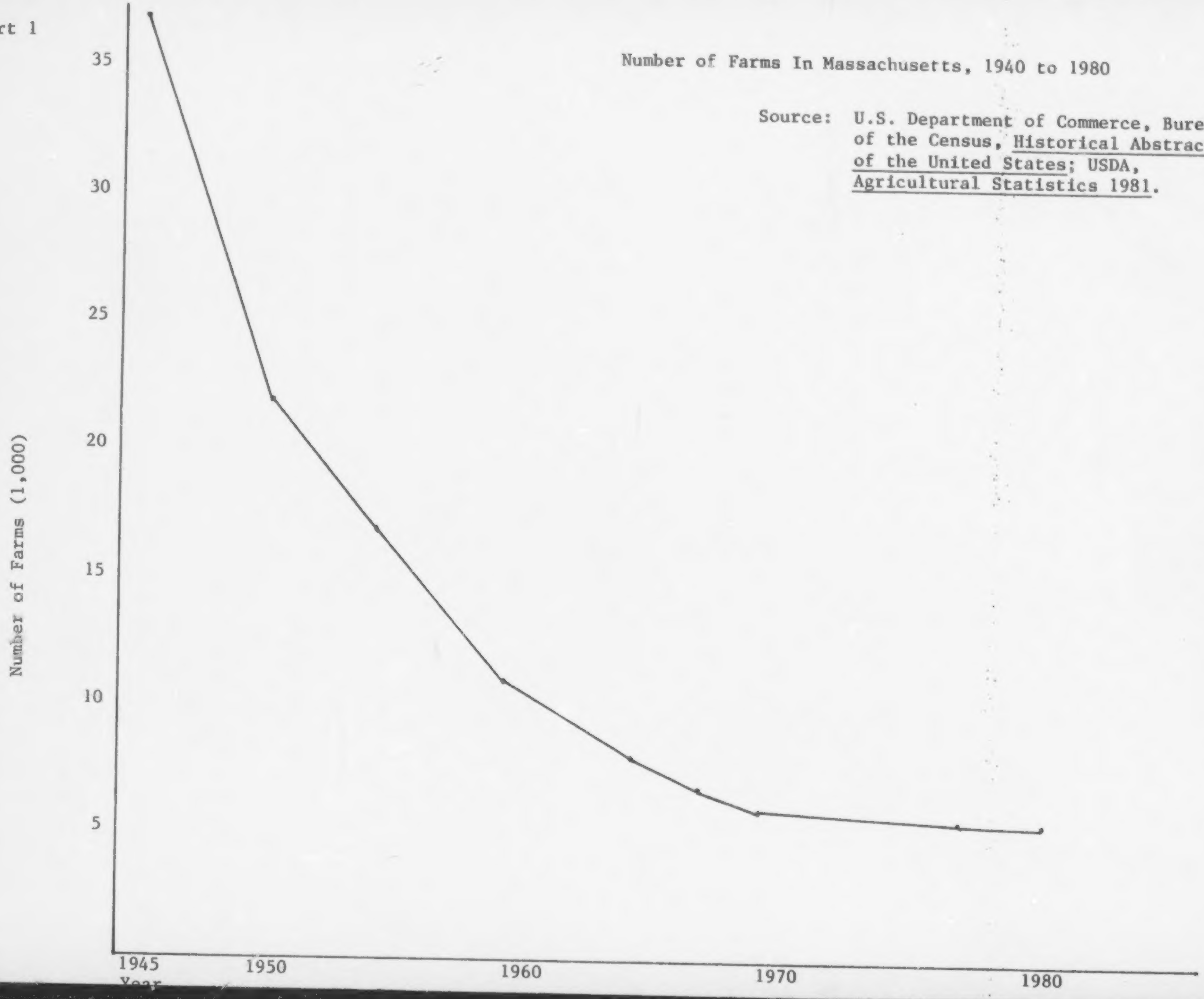
Farm Numbers and Size

The current statistical definition of a farm is "any place from which $1,000 or more of agricultural products were sold, or normally would have been sold".[27] Given a small scale or regional farming system, this definition overlooks those producers whose income is below $1,000, but whose impact on the local food system is nevertheless important. In the future, data on farm numbers should be augmented with information on food producers who are currently overlooked by the current statistical definition.

Given the data available, it can be seen that the number of farms in Massachusetts has declined steadily since 1945. (See Chart 1.) Since 1945, Massachusetts has lost 84 percent of its farms.[28] In 1981 alone, we lost another 100 farms throughout the state, shrinking an already diminished number to 5,800.[29]

Not only are there fewer farms, but these farms are becoming smaller. At an average size of 117 acres in 1981, Massachusetts farms remain far below the national average of 431 acres.[30] According to the Census of Agriculture, 65 percent of the farms in Massachusetts are under 100 acres, and 47 percent of these are under 50 acres.[31] Small parcels of farmland, despite having good soils, have often been considered uneconomical to farm. This attitude may be changing, however. Recent studies indicate an increase in small farms, particularly in the Northeast.[32] This has been accompanied by an increase in part-time farming. Small scale and part-time farmers grow vegetables, sweet corn, tomatoes, berries, apples, strawberries, beef cattle, sheep, goats, hay, forage crops, and others.[33] Small farms are a perfect match for traditional direct marketing techniques that benefit both farmers and consumers. Continued support from consumers, government officials and researchers studying small scale and part-time farming will help regenerate Massachusetts small farms.

Chart 1



Number of Farms In Massachusetts, 1940 to 1980

Source: U.S. Department of Commerce, Bureau of the Census, Historical Abstract of the United States; USDA, Agricultural Statistics 1981.

Farm Debt

A major reason for the loss of farmland and farms is the debt load which farmers carry, brought on by a combination of high capital requirements, increasingly higher interest rates, and low prices paid for farm products. Nationally, farm real estate debt rose 11 percent from 1980 to 1981.[34] Meanwhile, for the same period, Massachusetts farm real estate debt rose 13 percent to over $100 million. This is an average of about $17,000 per farmer.[35]

A young person interested in entering farming today faces substantial economic barriers. Real estate values in Massachusetts can be up to twice the national average.[36] To buy a moderately sized farm requires a capital outlay of $250,000 to $600,000,[37] usually acquired with a long-term mortgage. Even more money is required to start production. To bring in a modest annual income of $18,000, a farmer has to plan on gross sales of $100,000.[38] Only 8.2 percent of the farmers in Massachusetts fall into this catagory.[39]

To help offset their indebtedness and to make ends meet, 56 percent of the farm operators in Massachusetts are finding employment off their farm. For 70 percent of these, off-farm employment has become their primary source of income as they work 200 or more days away from their farm operation.[40] Even though production is limited by the number of hours the farmer has available to work on the farm, these farms can still provide a significant amount of food for local consumers. Those who cannot get assistance for their operation, or those who do not want or cannot find employment elsewhere, are forced to sell out to larger operators or to developers who will pay as much as $2,000 an acre for flat, well-drained farmland.

Pesticides

The Massachusetts Department of Agriculture administers a pesticide program which controls licensing and certification of pesticide dealers and users. However, pesticides are not always properly applied. They can drift far from their points of application, killing crops and beneficial insect populations downwind. Pesticides that are washed off by heavy rains can find their way into our water supplies, and some pesticide residues remain on the fruits and vegetables we buy in the grocery store.[41]

Since the pesticide program does not keep records of the amounts of pesticides used by farmers, it is impossible to determine the average rate of pesticide application on Massachusetts cropland, as compared to the United States average of 2.3 pounds of active ingredient applied per acre of cultivated cropland.[42]

Beyond the dangers of misuse, and contamination of our food and water, pesticides represent a substantial use of energy. Pesticide application and manufacture account for seven percent of the energy used to produce crops in Massachusetts.[43] This is equivalent to 872,000 gallons of gasoline. Controlling insects and weeds is necessary, but given their side effects and energy consumption, pesticides should be used not as a cure-all, but as a last resort when all other methods fail.

Fertilizers

Fertilizers are the most energy intensive agricultural input. In Massachusetts they account for about 26 percent of all the energy used in farming.[44] Even with a 4.6 percent decrease in fertilizer use from last year, our current 68,780 tons of application may still be too high.[45] Over-application of fertilizer results in wasted energy as well as wasted money.

A high dependence on chemical fertilizers means dependence on a diminishing mineral base, resulting in increased imports of phosphate, anhydrous ammonia (for nitrogen), and potash (for potassium). U.S. supplies of phosphate are expected to dwindle rapidly after the year 2000.[46] At the same time, 90 percent of our potash will be imported.[47] Increased fertilizer costs are bound to be passed along to the consumer.

Increased fertilizer application can lead to increased production, but many farmers routinely apply far more fertilizer than the soil needs or the crops can use. In a 1981 survey of soil testing labs, many labs gave conflicting results even though they were all given the same soils to analyze. Some labs reported inadequate fertilizer levels and recommended large fertilizer dosages while others showed adequate levels of phosphorus, potassium, or nitrogen for the same fields, but still recommended increased fertilizer applications. Residual levels of potassium, phosphorus, and nitrogen in soils are frequently overlooked or ignored, leading to additional applications of fertilizers that increase the farmers' production costs, but give no appreciable increase in yields.[48] In many cases farmers may be increasing their production costs unnecessarily.

Fisheries

The commercial fisheries industry in Massachusetts landed 438.4 million pounds of fish in 1980, generated a total economic impact of $757 million, and employed over 16,000 people.[49] With a 37 percent increase in catch size from 1977 to 1980 and a 57 percent increase in catch value, the fisheries industry would appear to be thriving.[50] Both fishermen and fish processors, however, express concern over a variety of issues that must be addressed to assure the continued success of the Massachusetts fisheries industry. Among these issues are economic pressure from imports, maintenance of fishing facilities, and contamination of shellfishing grounds.

In 1978, approximately 8.3 million pounds of fresh finfish were imported into Massachusetts from Canada.[51] Most of the 116 million pounds of frozen fish portions, sticks, and dinners processed in Massachusetts in 1976 were Canadian and European imports.[52] Since most of the Massachusetts fishing industry is based on filleted fresh fish, imports of fresh fish have the largest negative impact on the fish harvesting industry's gross revenues. While fishermen see fish imports cutting into their business, consumers enjoy a wider selection and lower prices for their fish. Fish imports also have the effect of increasing employment in the fish processing industry.

Commercial fishermen are currently investigating the market potentials of non-traditioanl fish, such as dogfish, shark, hake, and cusk.[53] Fishermen need information on the storage, offloading and processing techniques needed to maintain fish quality. Consumers need to be educated about the many varieties of non-tradional fish available that are nutritious, flavorful and less expensive than the better known fish species. Fishermen also feel the need to use more Massachusetts-caught fish in State institutions, school lunch programs, hospitals, and nursing homes.[54]

If fishermen are to expand their operations, they need adequate port facilities. Fishermen are concerned about deteriorating docks, congestion in dock and off-loading areas, and the lack of ice and boat maintenance facilities. Port communities are often reluctant to allocate funds for an industry that appears to have little economic impact throughout the community. A closer look however, reveals that commercial fishing generates a lot of overlooked dollars in the community through the subsidiary industries of bait, equipment sales and service and fish processing and sales.[55]

Another aspect of the fishing industry is the contamination of shellfishing grounds by sewage dumping and accumulations or spills of toxic substances. To the north of Boston Harbor, 6,250 acres of shellfish grounds, with an estimated annual potential harvest of 73,450 bushels, are contaminated by sewage waste to the extent that shellfish harvesting is restricted.[56] Clams and oysters filter out and store bacteria and viruses from the contaminated waters in which they feed. Forty-nine percent of the 6,250 acres of shellfish grounds on the North Shore are considered to be moderately contaminated.[57] Clams and oysters harvested from this area must be purified by holding in sterilized water for 48 hours. Purification facilities are operating at capacity and are unable to meet demand.[58] Shellfish from contaminated waters can also be transferred to clean waters, where they will become naturally purified.

As toxic substances such as mercury, oil, and Polychorinated Biphenols (PCB's) have accumulated or been spilled into Massachusetts waters, some shellfishing grounds have been closed, including small areas of Sippican Harbor, Falmouth Inner Harbor, Great Harbor, Falmouth and Red Brook, and Bourne.[59] The amounts and types of toxic substances that contaminate Massachusetts shellfishing areas reflect the manufacturing industries and sewage treatment facilities inland. Clearly, land based activities need to to carefully evaluated to determine their impact on other resources, including the oceans.

The Massachusetts commercial fisheries industry makes a significant impact on the state's economy, and provides a good supply of high-quality protein for Massachusetts residents. There are many complex issues that must be addressed if this valuable resources is to be maintained and improved.

RECOMMENDATIONS

Developing a secure, sustainable and affordable food system is the goal of The Cornucopia Project. To attain this goal will require a great deal of work. In Massachusetts, this work has been begun by a wide variety of individuals and organizations. Efforts toward building a sustainable food system in Massachusetts range from establishing community farms to the Governor's Executive Order recommending that state institutions purchase foods grown in Massachusetts.[60] The recommendations given in this report reflect and complement the work that is being undertaken by Massachusetts consumers to build a sustainable food system.

The major strategic themes running through these recommendations are outlined below. There are recommendations for all sectors of the food system; the farmers who produce our food; the food industry which processes and distributes our food; the cities, which would suffer in the event of a food crisis; the state and local governments which have the power to do many of the things to make Massachusetts' food supply secure; and the research community which can improve the system we now have.

MAJOR STRATEGIC THEMES

I. Massachusetts Should Grow More Food For Local Consumption

Growing more food in-state will provide fresher, better tasting, and more nutritious food for Massachusetts residents. Local production keeps more of our food dollars in-state, creates jobs, and increases state revenues. Less energy will be used in getting food from the field to the table.

A good place to start increasing in-state production is with fruits and vegetables. In 1980, we imported 78 percent of the fresh fruits we consume and 77.3 percent of our fresh vegetables. (See Tables 2 & 3.) Massachusetts has the climate and soils to grow 43 percent of its fresh fruit consumption and over 90 percent of its fresh vegetable consumption.

Home gardens are another way of increasing the amount of food grown in Massachusetts. The average cost of a garden is about $25, for seed, soil preparation, fertilizers, mulch and water. With labor investment of five hours per week, the home gardener can harvest 500 pounds of vegetables worth $414.[61]

II. Massachusetts Should Encourage Local Markets

The benefits of buying locally as much food as possible are numerous and include lower transportation costs, less energy consumed in transportation, less waste due to long distance hauling, and potentially more nutritious produce, since vitamin and mineral content decreases with time following harvest. Local farmers benefit as much as consumers because they have a market for their produce which will pay more than an interstate broker. Currently, about half of the food producers in Massachusetts use some form of direct marketing. Statewide, in 1981 there were 42 farmers' markets and about 500 roadside stands.[62] A U.S. Department of Agriculture study of direct markets showed that local farmers received 44 percent higher gross returns if they sold locally than if they marketed through wholesale channels.[63]

Table 1

Imported Fresh Fruits That Could Be Grown in Massachusetts

Commodity	Amount Imported (%)	Land Required[a] (acres)	Retail Value of Import ($)
Apples	3.56	6,316	1,299,070
Cherries	99.9	2,304	4,436.030
Grapes	99.8	3,219	23,905,720
Melons	97.1	2,673	16,174,110
Peaches	95.6	5,593	15,994,200
Pears	92.0	1,332	7,982,930
Plums	99.6	2,802	6,598,860
Blueberries	31.5	1,201	387,530
Strawberries	85.1	2,376	10,219,310
TOTAL	78.2%	27,816	$86,997,760

a. to provide 100% of consumption.

Table 2

Imported Fresh Vegetables that could be grown in Massachusetts

Commodity	Amount Imported (%)	Land Required (acres)	Retail Value of Imports ($)
Asparagus	65.9	788	1,349,000
Snap beans	48.3	2,334	3,605,870
Broccoli	97.7	1,293	5,715,990
Cabbage	60.0	220	6,072,260
Carrots	82.0	1,346	8,180,900
Cauliflower	88.6	827	4,528,290
Celery	99.5	927	16,536,790
Cucumbers	67.8	2,169	6,454,380
Eggplants	58.3	170	791,610
Lettuce	94.5	6,219	81,643,520
Onions	88.5	1,995	12,477,130
Peppers	75.6	2,213	9,236,740
Potatoes	67.6	13,391	25,447,370
Spinach	83.9	625	4,246,430
Tomatoes	82.0	4,050	38,340,000
TOTAL	77.3%	38,567	$ 224,626,280

a. to provide 100% of consumption.

Consumers received an average 28 percent discount compared to supermarket prices.[64]

One quick and inexpensive way to augment Massachusetts' existing marketing program would be to conduct and publish a survey of all food producers and large-volume food buyers -- such as grocery stores, hospitals, industry, and restaurants -- to determine what farmers would produce, given a market, and what institutions would purchase, in terms of commodity and quantity. Farmers would know what the market was and buyers would know where to obtain fresh, wholesome produce.[65]

III. Massachusetts Should Maintain Its Farm Resource Base

Preservation of Massachusetts farmland can no longer be a debatable issue. We need all our prime farmland. We can no longer afford uncontrolled development on our best lands.

Farmers are critical components of our food system. Efforts must continue to make their livelihood profitable, sustainable, and accessible. People who wish to farm must have the financial and technical support to do so. Farm support services must be maintained to provide essential materials and services to the farm community, especially beginning farmers and small scale producers. Farm equipment dealers, seed and fertilizer salespeople, feed mills, and agricultural credit associations as well as the cooperative extension service supply some of the necessary inputs to the farm sector. The strength of Massachusetts' farm resource base is dependent upon these component parts. Support services are no less important than the other elements.

IV. Massachusetts Should Continue to Expand Consumer Education and Awareness

Informed consumers can actively participate in working towards sustainability and regeneration in the food system. Consumer demand can effectively influence the Massachusetts food industry more than any regulatory or legislative action. Individuals can also have a tremendous impact on local grocery stores and their purchasing policies simply by asking for locally-grown, locally-processed foods. Increased consumer awareness and action may be the single most effective force in changing the direction of Massachusetts' food system.

RECOMMENDATIONS TO CONSUMERS

1. Become more active in your food system. Increase your awareness of what foods are locally produced and which are transported in from other areas of the country. Know the nutritional quality of the food you consume. Share information with friends, neighbors, and supermarket and grocery store personnel.

2. Form a local Cornucopia Project consisting of people who want to work at changing some aspect of their food system. Possible activities include establishing home and community gardens, bartering, cooperative food buying, storing and preserving, setting up food banks, and gleaning from harvested fields.[66]

3. Purchase locally-grown fruits and vegetables in season, taking advantage of their peak nutritional value and decreased cost. You can also process these foods and store them for cold weather months to eliminate higher commercially processed and packaged food prices.

4. Support your local farmers by purchasing food directly from growers, thereby increasing their needed financial support while enjoying fresh, nutritious foods at reasonable prices. Start food co-ops and for additional savings, contract with farmers in the region to produce some of your food.

5. Change your eating habits to improve and maintain your health by consuming less fat, salt, sugar, and cholesterol while increasing fiber and vegetable protein intake.

6. Start a home garden to produce more of your own fruits and vegetables. Community gardens provide a greater selection of produce when the harvest is shared with cooperating gardeners. They offer access to land for those (especially urban residents) who might otherwise be unable to garden.

7. Extend your growing season by building solar grow-frames and/or utilizing container gardening.[67]

8. Start a land trust which could purchase critical agricultural properties as they come on the market, resell them with deed restrictions to new farm owners, or transfer them to other appropriate trusts or to the city, county, or state at some future time. A land trust is a non-profit corporation which is able to own real property or interest in real property. It is one way to offer permanent protection to selective farming areas within local communities.

RECOMMENDATIONS TO FARMERS

I. Farmland Preservation

1. Take advantage of existing laws. Farmers should become better informed about specific state and local laws which can benefit them. These include: differential assessment (Chapter 61A, Farmland Assessment Act (1973); purchase of development rights (Agricultural Preservation Restriction (APR) program).[68]

2. Learn about the diversity of technical assistance and services available to farmers through local conservancies and land trusts, which can show the best options for the future use of land, including areas which are not essential to farm production. This kind of planning service would help farmers realize certain economic benefits while still maintaining and preserving their farm operations.[69]

3. Preserve farmland by markedly decreasing soil erosion. Your local soil conservation district will provide you with assistance in developing or updating a soil and water conservation management program, suggesting strategies to build the soil and reduce the need for increasingly costly fertilizer inputs.

4. Reduce soil losses through combinations of structural and management practices, such as conservation tillage, cropland terraces and diversions, contour farming, the use of crop residues, winter cover crops, and hedges.

5. Take land that is severely eroding out of production.

6. Use marginal lands for grazing livestock instead of crop production.

7. Have soils tested accurately to determine the nutrient value of the soil and its fertilizer needs in order to prevent overuse of costly, energy-intensive fertilizers. Beware of inaccurate soil testing services.

II. Farm Inputs/Resources

1. Diversify production with selected combinations or rotations of crops or an interplay of crops with livestock. This practice would reduce fertilizer and weed control costs while providing the farmer with greater market stability.

2. Diversify production regarding not only types of crops but individual strains of a single crop so as to reduce the risk of farm pests blighting the entire crop.

3. Reduce energy use by investing in more fuel-efficient machinery, looking into solar dryers, letting crops dry naturally whenever possible, adding insulation where feasible, and taking advantage of natural lighting in farm buildings.

4. Consider using management practices that will reduce the need for chemical fertilizers, pesticides, and other expensive inputs.

5. Investigate possibilities for using alternative energy sources, whether they be the conversion of manure into methane or the use of solar heat for crop drying and other on-farm energy requirements.

6. Develop on-farm fertilizer sources by growing nitrogen-fixing legumes and green manure crops.

7. Utilize marginal land in combination with more productive soils and proper management to maintain more cattle, thereby increasing beef and organic fertilizer production.

8. Avoid routine spray schedules. Apply pesticides only when needed and target spraying to delay the onset of insect resistance, reduce undesirable residues, do minimal damage to beneficial insects, and decrease costs.

9. Consider alternatives to pesticide use and/or reduction. These could be: integrated pest management involving monitoring pest levels for proper timing of applications, no-tillage, crop rotations and interplanting, narrow rows or broadcast seeding to establish a canopy sooner than with wide row spacing, and biological control of pests to maintain the natural ecosystem.

III. Marketing/Economics[70]

1. Organize marketing co-ops to provide restaurants, schools, and other institutions with locally-grown produce.

2. Work cooperatively with the consumer by selling directly to the public. This will ensure a higher price for the farmer's goods and fresher produce for the consumer at a lower cost.

3. Locate marketing centers strategically for the assembly, grading, packing, and distribution of the output from many small producers,

thereby providing large buyers with the volumes and specifications they require.[71]

4. Consider small-scale processing on the farm such as processing sausage, cured meats, pickles, preserves, cheeses, etc. Fresh produce can be washed, stored and packaged for sale to restaurants and markets. Dried beans, nuts, and seeds as well as honey can be sold to food stores and restaurants.

5. Investigate before planting what specific varieties of crops purchasers wish to buy by surveying bulk food purchasers in your area.

6. Sharpen marketing skills by examining price movements to forecast supply and demand. De-emphasize concentration on farm production while allowing time to think, plan, read and analyze the current market so as to obtain a better price for agricultural products.[72]

7. Extend the availability of some produce by staggering planting and harvesting dates between the last frost date of the spring and first frost date of the fall and by selecting varieties with varying periods of maturation. For example, the fall/winter oriental vegetable crops being developed at the Rodale Research Center are capable of extending the growing season.

8. Begin to work towards changing grading and marketing standards that reflect the nutritious quality of the crop rather than its uniformity and appearance.

9. Encourage local newspapers, if a section is not already provided, to devote columns to farm problems and a listing of local/seasonal food availability.

RECOMMENDATIONS TO LOCAL GOVERNMENTS

1. Identify the long and short-term costs to a township before converting any prime farmland to development use.
2. Develop and encourage local food production by:
    - a. Establishing city-run gardens in low income areas, and/or providing seeds, tools, and technical assistance on gardening to those receiving food stamps and other kinds of food assistance.
    - b. Providing funds to establish gardens and/or greenhouses and subsidizing gardens in schools, prisons, hospitals, and nursing homes.
    - c. Establishing community farms on urban fringes to be worked by local farmers or interested city residents. Greenpower Farm in Weston is a good model for this.
    - d. Promoting contract growing whereby groups of urban families, co-ops, or the city itself arrange to purchase food directly from a local supplier.
    - e. Developing loan funds for food self-reliance projects, such as greenhouses, food preservation and storage operations, and small businesses associated with urban agriculture.
    - f. Estabishing urban agricultural testing programs with the state Cooperative Extension Service to test crop varieties, analyze soil for nutrients and pollutants, test crops for pollutant residues, prepare demonstration sites for various types of urban agriculture and waste recycling, and offer technical assistance on farming as well as design and construction of community greenhouses, cold frames, rooftop gardens, etc.
    - g. Encouraging local industries which produce low grade waste heat to make use of this energy by producing food in attached greenhouses.
    - h. Requiring garden areas in new multiple unit housing projects.
    - i. Making certain that urban street tree programs preserve solar access for food production.
3. Develop an encourage local markets by:
    - a. Creating mobile farmers' markets and/or fish markets to visit housing projects, neighborhood centers, factories, and universities. Cambridge currently has a bus supplying food to the elderly.

b. Assisting in the formation of food cooperatives, co-op stores, and preservation/storage centers.

4. Develop and encourage local food processing and storage by sponsoring community food preserving facilities where residents use this service free or at a low cost and/or providing incentives to grocery stores to establish food preserving facilities for their shoppers.

5. Facilitate access to food by implementing a "food hotline" to provide referrals for emergency food, food stamps, and meals for elderly.

6. Create a greater understanding of the importance of agriculture to urban areas through educational programs. Offer seminars in urban agriculture, aquaculture, container and rooftop gardening, food preservation, storage preparation, and nutrition.

7. Establish food banks in your area to store and distribute surplus food.

8. Have county institutions purchase their food supplies from local farmers. Executive Order No. 222 recommends this.

9. Set aside areas for recycling facilities.

10. Investigate land use techniques like clustering, performance controls, and transfer of development rights which would give farmers greater options to develop either on the farm or in other areas within the community or region.

11. Establish an Agricultural Development Council similar to the one in Chester County, Pennsylvania. This council would focus on generating economic solutions to the problems of farmland loss in the counties. These local agricultural development councils would be comprised of people from the entire food system in the county and include farmers, processors, distributors, store managers, and farm service equipment dealers, as well as realtors and bankers. The council could develop local markets for local producers. It could survey local producers to see which ones would grow produce for local consumption and survey local stores, restaurants, and institutions to encourage them to purchase more locally grown foodstuffs. The council could also determine where local food is coming from and could promote more consumption of local foodstuffs, As suggested by Chester County, the council could become involved in "farm brokeraging" which would match new farmers with those who want to sell.

12. In addition to enforcing the soil erosion and sedimentation control measures, pass local ordinances similar to the one in Sterling, Wisconsin, which is successfully conserving all agricultural lands over 1 acre in size with a slope greater than 6 percent.

13. Investigate the agricultural Land Evaluation and Site Assessment (LESA) system being developed by the Soil Conservation Service and the U.S. Department of Agriculture. The program will assist planners in identifying farmland that should be protected based on land capability, soil productivity, soil potentials, and important farmland rating.

RECOMMENDATIONS TO THE STATE

1. Promote agricultural production within Massachusetts and in nearby states by:

    a. Offering incentives for farmers to diversify production, utilizing technical assistance from extension agents and low-interest state-guaranteed loans to make changes necessary for diversification.

    b. Establishing demonstration experiments to test crop, animal, and fish varieties suitable to our soil and climate as well as developing low-input sustainable farming techniques.

    c. Providing tax incentives for small-scale food producers, such as not taxing the first $10,000 of income from food produced for local consumption.

    d. Issuing state tax credits for home and farm production, processing, and storing of food.

    e. Encouraging new farmers through loans and incentives to enter into certain types of farming operations, those which would maintain the optimal balance of farm types in the state. (See Research Recommendations #1).

    f. Organizing a farmer linkage program whereby experienced farmers bring prospective farmers into their operation, easing the transfer of land ownership over time. In this way the new farmers would be more successful in avoiding costly farming mistakes while gaining the tenured operator's knowledge of the farm.

    g. Establishing a statewide Agricultural Development Council which would seek to enhance the viability of farming throughout Massachusetts in the same way that industrial development agencies seek to encourage industry to locate in-state. This kind of council would consist of representatives from all parts of the food industry.

2. Preserve remaining farmland in the state by:

    a. Publishing guidelines to help local governments protect agricultural land and enhance farming. These guideline could include ways to prevent "leapfrog" or random development, which removes from production not only the land that has been developed, but which in the long run isolates adjacent farming areas and inhibits certain farming activities. The state could also delineate ways whereby municipalities could best protect farmland in urban fringe areas, and it could prepare guidelines for different kinds of farmland preservation strategies and techniques including agricultural zoning, transfer of development rights, purchase of development rights, community land trusts, performance zoning, and so forth. It could prepare procedures which would help local governments assess the different kinds of strategies that would be most appropriate and feasible for them, given the extent of farming in the area, development pressures, commitment of farming community to remain in agriculture, existing and potential land use, economic characteristics, natural features, and attitudes of local residents towards preserving farmland.

b. Mapping all farmland that the state believes should be protected from development, identifying all Class I and II soils that are crucial to the agricultural capabilities of the state. The state of California has been engaged in mapping all of its farmland for the last few years in order to identify those areas that are important to the state for agricultural production.

c. Instituting a farmland capital gains tax in ways which would discourage speculators from investing in farmland, and selling it for development.

d. Creating a committee to inventory and monitor all state-owned farmland and assess its productive capability while working to ensure that this land remains in farming.

e. Encouraging municipalities to enact and adopt joint municipal comprehensive plans and joint municipal zoning ordinances. This would be one way to achieve agricultural zoning on a more regional basis, which could anticipate many of the current challenges to its constitutionality.

f. Encouraging legislation which would require a record of agricultural land transfers on an annual basis.

g. Encouraging legislation that would encourage small farming by establishing a family farm security program to encourage loans for the purchase of farm real estate.

h. Reducing the capital gains tax for those farmers who sell farmland to young, beginning farmers, especially if farmland is sold at less than full market value.

3. Expand local markets by:

   a. Establishing more farmers' markets and organizing wholesale farmers' markets to supply retailers, consumer co-ops, and other volume purchasers.

   b. Increasing promotional efforts for direct purchase of food from farmers by supermarkets, restaurants, schools, hospitals, and other institutions.

c. Encouraging existing processing plants to purchase locally-grown products.

d. Developing linkages between large-volume food buyers and Massachusetts producers.

e. Continuing to support the direct marketing efforts of small scale growers, through grants and technical assistance.

f. Assessing the viability of implementing in Massachusetts marketing alternatives to determine price and maintain market access for individual farmers through electronic commodity markets, vertical coordination through forward contracting, forward deliverable contract markets, and mandatory public reporting of market information. Other options include exclusive agency bargaining, vertical integration through ownership, joint venture between agricultural cooperatives and agribusiness-marketing firms, marketing orders, and marketing boards.[73]

g. Establishing regional livestock marketing committees to evaluate alternatives such as regional market centers owned and operated by either a local or a regional cooperative, a regional electronic sales exchange, and contract sales to packers, while providing for more direct movement from producer to slaughterer thereby decreasing costs.

4. Strengthen in-state food-processing capabilities by:

   a. Providing incentives for existing food companies to develop more energy-efficient processing and packaging techniques, along with incentives to attract new food processors who wish to reduce transportation costs by locating near a major distribution center.

   b. Helping to establish community food processing and storage facilities for the use of families and small commercial food producers. In this way, economies in equipment and energy consumption can be realized.

   c. Providing incentives for on-farm processing, cooling, and fresh packing of local food crops.

5. Effect a transition from depletable to renewable energy sources by conducting regional inventories of all renewable energy sources and providing incentives, such as tax credits or low-interest loans for investments made in agricultural energy conservation and on-site development of renewable energy sources, or tax exemptions for income received from the production of renewable energy.

6. Recycle organic wastes to utilize their full potential by:

    a. Preparing a state-wide inventory of the types and amounts of organic wastes available now and into the future and assess the ability of these wastes to improve soil fertility and tilth and their potential energy use.

    b. Developing incentives for using local organic wastes for fertilizer and incentives to industry to separate toxic substances from their wastes so that they might be more safely used on cropland.

7. Enact a bill which requires returnable bottles and the recycling of metal cans. This would reduce materials consumption in the food system. Massachusetts' new bottle law does not include containers used for dairy products or fruit juices.

8. Protect the natural environment by enforcing existing environmental protection laws, developing programs for safer handling of toxic pesticides and stronger enforcement of laws against pesticide misuse, and developing stricter standards for pesticide residues in foods. Collect data on pesticide use in Massachusetts.

9. Develop long-range food system plans by:

    a. Revising and improving the methods by which crop and livestock production data are gathered so that the future direction of the state's agriculture situation is determined based on accurate, reliable information.

    b. Creating an overall state food policy which will increase regional self-reliance and economic viability while decreasing the vulnerability of the state's food supply.

    c. Planning for an emergency food supply disruption by strengthening our grain storage facilities capacity.

    d. Conducting an annual study of the condition of the state food system to find out the amount of food currently being imported and exported, soil erosion losses, amount of land lost to development, and other food system issues while stating what Massachusetts can do to increase its self-reliance.

10. Instill a greater understanding of agriculture's role in all Massachusetts citizens by:

    a. Increasing awareness of seasonal, locally-grown produce, and its nutritional and economic benefits.

b. Initiating educational programs on farmland preservation, farm energy conservation, reduced pesticide and fertilizer use, recycling of organic wastes, and energy expenditures in different methods of farming and home food production and preparation.

c. Promoting nutrition education campaigns illustrating the relationships between diet and health and the benefits of fresh, locally-grown, and minimally processed foods, as well as bulk purchasing of food.

d. Communicating goals and the condition of our food supply as revealed in the state's annual study.

RECOMMENDATIONS TO THE FOOD INDUSTRY [74]

1. Minimize energy and material use by using less processing (and/or more efficient methods), simpler packaging, and rail networks more often in transporting commodities.

2. Move towards regionalizing food purchasing, processing, and distribution, thereby decreasing transport costs and strengthening the local economy with increased use of local labor.

3. Promote the consumption of fresh, locally-produced food in season, enhancing consumer nutrition and building a stronger local economy.

4. Provide nutrition education, hints for food preparation, and techniques on preserving fruits and vegetables.

5. Focus on food in a holistic way, recognizing that diet is an essential component of a healthy life and is influential in preventing as well as treating illness.

6. Grocery stores should be encouraged to label locally grown foods. Point of purchase literature could be made availabe to consumers to make them aware of where their food comes from and the issues involved with this.

RECOMMENDATIONS TO THE AGRICULTURAL RESEARCH COMMUNITY

1. Determine the optimal mix of farm types in Massachusetts to obtain sustainable yields of both crops and livestock to meet the state's consumption needs and to provide a sufficient level of exports. Determine the production needed to support processing plants for various commodities. If the commodity is produced in quantities sufficient to make a processing plant economically competitive, this would be an incentive for establishing those businesses in state.

2. Assess relationships between biofuels development (including forest resources) and long term soil productivity to provide guidelines for future programs.

3. Investigate how to improve the capability of using forage and Massachusetts crop wastes.

4. Continue and expand small-scale agriculture research programs at the University of Massachusetts. This will not only aid small-scale enterprises, but will also help large-scale farms diversify and become less dependent upon a single commodity. Efforts along this line will help meet local food needs and keep Massachusetts farmland in production.

    a. There is a need for smaller equipment which would use less energy and decrease the amount of soil compaction and erosion, at a cost that small operators can afford.

    b. Continue and expand research on fruits and vegetables and post-harvest handling methods to benefit small-scale producers.

    c. Continue livestock management and forage research programs aimed at smaller enterprises.

    d. Continue to develop beef feeding systems based on forages rather than high-energy grains.

5. Work to develop plants which resist pests and mature earlier so less drying is required.

6. Investigate Massachusetts soil erosion problems, looking at crop residues, run-off, tillage practices, rotation systems, terraces, equipment use, etc.

7. Investigate perennial agricultural systems (permaculture) appropriate to Massachusetts to eliminate annual soil disturbance and decrease energy, fertilizer, pesticide, and herbicide usage.

8. Determine the long-term effects of recommended applications of chemical fertilizers, pesticides, and herbicides on the productivity of selected Massachusetts soils.

9. Update the Stanford Research Institute's inventory of the organic wastes in Massachusetts which are available to improve soil fertility and tilth.

10. Investigate methods to utilize Massachusetts municipal wastes in agriculture.

11. Expand research on biological nitrogen fixation.

12. Develop crop varieties adaptable to low-input farming systems in Massachusetts.

13. Explore the potential of small-scale aquaculture in Massachusetts to provide high-quality protein using cost-efficient and ecologically sound methods.

14. Set up plots to study the transition phase of switching from conventional to low-input farming systems.

15. Examine methods for producing food in cities, e.g. rooftop food production systems. Seek ways to make urban food distribution and marketing systems more accessible to local and regional food producers.

16. Develop more energy-efficient food processing, storing, and distribution techniques.

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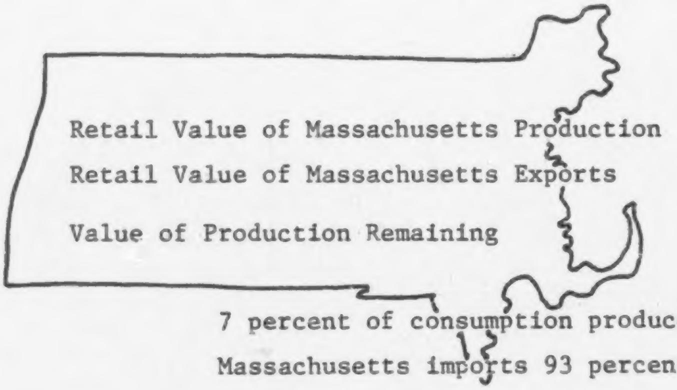
APPENDIX

Massachusetts has a history of successful agriculture, from Colonial export crops to the market gardens of the 19th century that supplied East Coast cities with lettuce, radishes, onions, apples, asparagus and other crops. Today, 93 percent of our food is imported from states as far away as California, Washington, Iowa and Florida. Importing our food deprives the Massachuseets economy of $4.8 billion each year. Out of every dollar we spend on food, ten cents pays for transportation. Gas shortages, labor disputes, political actions and bad weather make our food supply vulnerable to disruption.

After forty years of decline, Massachusetts agriculture is beginning to show signs of recovery. The number of small farms producing food for local consumption is on the rise. Consumers have discovered that farmers' markets, roadside stands and pick-your-own operations provide them with fresher food at lower prices. More people than ever before are planting vegetable gardens, either in their own backyards, or in community gardening programs. Farmland is now recognized as a priceless resource, to be carefully preserved. Many private and public sector groups and individuals are working together to make Massachusetts' food and agriculture system sustainable.



Retail Value of Massachusetts Production	$ 608,281,570
Retail Value of Massachusetts Exports	223,456,650
Value of Production Remaining	$ 384,924,920

7 percent of consumption produced in Massachusetts

Massachusetts imports 93 percent of its food.

MASSACHUSETTS FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight[a] (1,000 lbs.)	Retail Value[b] (1,000 lbs.) (1980 dollars)	CONSUMPTION Retail Weight[c] ($1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	IMPORTS % Import	Retail Value of Import ($1,000)	EXPORTS % Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of MA Consumption[d]
Meats									
Beef	ND[e]		438,880.0	1,042,270.0	90.0*	938,043.00			2,831,664.0
Pork	ND		391,830.0	546,600.0	90.0	491,940.00			885,873.0
Lamb	ND		7,458.15	18,846.74	90.0	16,962.06			40,063.0
Veal	ND		86,050.0	264,173.50	90.0	237,756.15			f
Poultry									
Chicken	insignificant		286,850.0	304,060.0	99.9	303,755.94			3,757,600.0
Turkey	insignificant		62,533.7	61,595.7	99.9	61,534.10			51,831.0
Eggs	17,567.78	10,189.31	198,500.0	115,130.0	91.1	104,883.43			142,045.0
Fish									
Finfish: fresh & frozen	69,643.50	177,590.0	30,980.0	78,999.0			55.5	98,562.45	NA[g]
canned	NC[h]		21, 227.04	54,128.94					NA
Shellfish: fresh & frozen	28,248.0	40,959.60	14,342.59	20,796.76			49.2	20,152.12	NA
canned	NC		2,868.52	10,871.69					NA
Dairy									
Fluid Milk	322,740.0[i]	68,733.94	1,384,900.0	317,140.0	78.3	248,320.62			251,360.0
Cream	ND		47,617.41[j]	39,189.13					46,713.0
Butter	ND		25,242.96	49,476.21					104,460.0
Cheese	5,099.0	15,144.03	100,970.0	299,880.0	94.9	284,586.12			238,239.0
Dry Milk	ND		38,438.15	62,654.18					17,581.0
Frozen Dairy Products[k]	88,162.50	80,227.88	150,884.01	137,304.51	41.6	57,118.67			86,784.0

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MASSACHUSETTS FOOD IMPORTS

	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
COMMODITY	Retail Weight[a] (1,000 lbs.)	Retail Value[b] (1,000 lbs.) (1980 dollars)	Retail Weight[c] ($1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of MA Consumption[d]
Vegetables, fresh									
Artichokes	NA		1,721.11	774.5	100.0				NA
Asparagus	587.50	699.12	1,721.11	2,048.12	65.9	1,349.71			788.0
Beans, snap	1,546.86	943.60	7,458.15	4,549.47	79.3	3,607.73			2,334.0
Broccoli	226.32	135.79	9,752.56	5,851.78	97.7	5,717.19			1,293.0
Cabbage	19,275.55	4,047.87	48,191.11	10,120.13	60.0	6,072.08			220.0
Carrots	6,291.03	1,792.94	34,995.93	9,973.84	82.0	8,178.55			1,346.0
Cauliflower	847.50	580.54	7,458.15	5,108.83	88.6	4,526.42			827.0
Celery	225.99	89.72	41,880.37	16,626.51	99.5	16,543.38			927.0
Corn, sweet	53,360.00	20,543.60	37,864.44	13,555.47			34.0	6,984.82	4,900.0
Cucumbers[l]	7,395.42	3,069.10	22,948.15	9,523.48	67.8	6,456.92			2,169.0
Eggplant	1,194.93	565.20	2,868.52	1,356.81	58.3	791.02			170.0
Garlic	NC		4,589.63	7,848.27					436.0
Lettuce	7,902.0	4,780.73	142,850.0	86,424.[illegible]	94.5	81,670.92			6,219.0
Mushrooms	-0-	-0-	15,490.0	25,558.50	100.0	25,558.50			NA
Onions	6,745.44	1,625.65	58,517.78	14,102.78	88.5	12,480.96			1,995.0
Peppers, green	4,611.68	2,974.54	18,932.22	12,211.28	75.6	923.29			2,213.0
Potatoes, sweet	-0-	-0-	19,505.93	7,997.43	100.0	7,997.43			1,882.0
Potatoes, white	91,496.45	12,169.03	282,830.0	37,616.40	67.6	25,428.69			13,391.0
Spinach	645.74	813.64	4,015.93	5,060.07	83.9	4,245.39			625.0
Squash	48,722.09	12,180.52	6,218.92[m]	1,554.73			87.2	10,621.42	NC
Tomatoes	11,780.0	8,422.7	65,402.22	46,762.59	82.0	38,345.32			4,050.0
Minor vegetables[n]	712.4	391.82	43,027.78	23,665.28	98.3	23,262.97			
Vegetables, canned and frozen									
Asparagus	NC		2,065.33	4,378.51					1,150.0
Beans, snap & lima	NC		45,724.18	36,579.35					11,134.0
Beets	NC		6,884.45	1,652.27					310.0
Broccoli	NC		8,031.85	8,272.81					1,303.0

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MASSACHUSETTS FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight[a] (1,000 lbs.)	CONSUMPTION Retail Value[b] (1,000 lbs.) (1980 dollars)	Retail Weight[c] ($1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	IMPORTS % Import	Retail Value of Import ($1,000)	EXPORTS % Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of MA Consumption[d]
Vegetables, canned and Frozen									
Carrots	NC		8,203.96	4,594.22					505.0
Cauliflower	NC		2,639.04	2,797.38					385.0
Corn, sweet	NC		44,347.30	23,504.07					14,930.0
Onions	NC		3,901.19	2,067.63					125.0
Peas	NC		27,767.26	18,750.90					7,571.0
Pickles	NC		39,585.55	19,001.07					2,822.0
Potato products	NC		137,680.0	155,580.00					16,653.0
Sauerkraut	NC		6,884.45	2,753.78					263.0
Spinach	NC		7,171.30	3,513.94					588.0
Sweet potatoes	NC		5,737.04	4,618.32					643.0
Whole tomatoes	NC		34,995.93	15,783.16					2,856.0
Tomato sauce, catsup, & paste	NC		69,418.15	35,125.58					13,539.0
Fruits, fresh[e]									
Apples	88,520.37	35,142.59	91,792.59	36,441.66	3.6	1,310.82			6,316.0
Apricots	NA		573.70	682.71	100.0	682.71			NA
Bananas	NA		119,330.0	41,407.51	100.0	41,407.51			NA
Blueberries	747.10	844.21	1,090.04	1,231.74	31.5	387.99			1,201.0
Cherries	Insignificant		3,442.22	4,440.47	99.9	4,436.03			2,304.0
Citrus	NA		159,480.0	72,084.96	100.0	72,084.96			NA
Cranberries	107,224.80	91,137.0	573.70	487.65			95.5	87,035.84	54.0
Grapes	44.96	52.15	20,653.33	23,957.87	99.8	23,909.95			3,219.0
Melon	1,105.10	486.25	37,864.44	16,660.36	97.1	16,177.21			2,673.0
Peaches	1,361.11	735.0	30,980.0	16,729.20	95.6	15,993.12			5,593.0
Pears	1,097.58	691.47	13,768.89	8,647.40	92.0	7,980.45			1,332.0
Pineapple	NA		8,031.85	10,361.10	100.0	10,361.10			NA
Plums	42.0	28.97	8,605.56	6,627.83	99.6	6,601.32			2,802.0

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MASSACHUSETTS FOOD IMPORTS

COMMODITY	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
	Retail Weight[a] (1,000 lbs.)	Retail Value[b] (1,000 lbs.) (1980 dollars)	Retail Weight[c] ($1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of MA Consumption[d]
Fruits, fresh (cont.)									
Strawberries	1,444.57	1,776.82	9,752.96	11,996.14	85.2	10,220.71			2,376.00
Other Berries[p]	59.42								445.0
Fruits, processed									
Canned fruits	NC		99,136.0	60,968.64					NA
Dried fruits	NC		16,866.89	41,879.49					NA
Frozen fruits	NC		15,891.60	22,985.61					NA
Apple juice	21,400.0	7,447.20	27,308.30	9,503.29	22.0	2,090.72			2,460.0
Other juices[q]	NC		262,920.0	85,711.92					NA
Grains									
Barley	NC		6,884.44	2,801.97					5,628.0[r]
Corn, (meal, cereal, starch, grits)	NC		90,645.18	32,450.96					36,474.0
Oats	389.73	172.65	17,784.81	7,878.67	97.8	7,705.34			8,824.0[s]
Rye (flour)	251.10	89.90	4,015.93	1,437.70	93.7	1,347.13			4,845.0
Wheat (flour, cereals)	NC		687,290.0	212,370.0					370,731.0
Miscellaneous									
Dried peas & beans	NC		39,585.56	26,126.47					36,653.0
Tree Nuts	NC		1,893.22	6,893.22					NA
Peanuts	-0-		34,995.93	72,791.52	100.0	72,791.52			NA

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MASSACHUSETTS FOOD IMPORTS

COMMODITY	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
	Retail Weight[a] (1,000 lbs.)	Retail Value[b] (1,000 lbs.) (1980 dollars)	Retail Weight[c] ($1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of MA Consumption[d]
Miscellaneous									
Sugar	NC		479,610.0	222,530.0					99,350.0[f]
Honey	396.0	526.68	8,031.85	10,682.36	95.1	10,158.92			NA
Maple Syrup	330.9	479.81	573.70	831.87	42.3	351.88			NA
Lard & Shortening	NC		119,330.0	97,969.93					
Margarine	NC		64,254.81	56,030.20					
Vegetable oil	NC		130,230.0	100,230.0					
Rice	NA		53,354.44	32,332.79					
TOTALS	1,019,442.42	608,281.57	7,285,391.48	5,202,396.58		3,252,038.93		223,356.65	9,165,595.0

Notes to Food Imports Chart

a. Retail weights of production were determined from: 1978 Census of Agriculture, Vol. 1, part 51; Massachusetts Agricultural Statistics 1980; Tom Marr, New England Crop Reporting Board; Conversion Factors and Weights and Measures, Statistical Bulletin No. 616.

b. Retail prices were supplied by: Robin Hickey, Massachusetts Department of Food and Agriculture; U.S. Department of Labor, Bureau of Labor Statistics; Meat and Livestock Statistics, Statistical Bulletin No. 522; Stop and Shop, Hadley, MA.

c. Retail weights of consumption were determined from Food Consumption, Prices, and Expenditures 1960-1980 Statistical Bulletin No. 672.

d. Land requirements are based on: Income Opportunities from Grain Corn Production on Massachusetts Dairy Farms, Massachusetts Agricultural Experiment Station Research Bulletin No. 645; USDA Agricultural Statistics 1980; Economics of Beef Production and Economics of Small Scale Food Producers by Robert Christenson, Massachusetts Co-operative Extension Service, Amherst, MA.

e. ND - Not disclosed to avoid disclosure of individual operations.

f. Veal is a by-product of the dairy industry, so land requirements would be included in dairy acreages.

g. NA - Not applicable.

h. NC - Not collected by any source.

i. Production figure is based on total milk production, less milk used on farm, and milk equivalents of manufactured dairy products produced in Massachusetts.

j. Includes yogurt, cream, milk-cream mixtures, sour cream, and eggnog.

k. Includes ice-cream, ice milk, sherbert, mellorine, and other frozen products.

l. Production includes cucumbers for pickling.

m. Consumption is fresh equivalent of canned.

n. Includes fresh peas, kale, brussels sprouts, limas, chicory, escarole, collards, and okra.

o. Production of fruits for processing included under fresh fruits.

p. Includes blackberries and raspberries.

q. Includes orange, pineapple, grapefruit and juices that cannot be produced in Massachusetts, and those for which no statistics are collected.

r. Acres required for production based on bushel equivalents of pearl barley.

s. Acres required for production based on bushel equivalents of rolled oats and oat cereal.

t. Acres required based on average yields for sugar beets.

* According to Stinson et. al. in Current and Projected Output of the Massachusetts Livestock Industry and Its Marketing Structure (Amherst: University of Massachusetts, 1978), about 90 percent of the red meat consumed in Massachusetts is imported from other regions.

Massachusetts Food System Organizations

There are many organizations which directly or indirectly are working toward developing a sustainable food system in Massachusetts. The organizations listed here provide information about starting home gardens, food co-ops, farmers markets, land trusts, community gardens, food assistance programs, farmland preservation, direct marketing and farm management. This list is just a sampling of the many groups in Massachusetts who are working to change our food system. Readers are encouraged to learn about the services of the different groups and where appropriate, to join with them.

Massachusetts Farm Bureau Federation
P.O. Box 455
85 Central Street
Waltham, MA 02254

Massachusetts Farm and Conservation Lands Trust
527 Essex Street
Beverly, MA 01915

Massachusetts Federation of Farmers' and Gardeners' Markets
Massachusetts Department of Food and Agriculture
100 Cambridge Street
Boston, MA 02202
(617) 727-5579

Massachusetts Food and Agriculture Coalition
c/o MOC
305 Whitney Street
Leominster, MA 01453

Massachusetts Horticultural Society
300 Massachusetts Ave.
Boston, MA 02115

Massachusetts Lobstermen's Association, Inc.
Box 276 Cove Creek Lane
Marshfield Hills, MA 02051

Atlantic Fishermen's Union
120 Main Street
Gloucester, MA 01930

Coolidge Farms
Topsfield, MA 01983
(617) 887-2787

Institute for Community Economics
151 Montegue City Road
Greenfield, MA 01301
(413) 774-5933

Massachusetts Agricultural Experiment Station
College of Food and Natural Resources
University of Massachusetts
Amherst, MA 01003

Massachusetts Association of Conservation Districts
P.O. Box 106
Vineyard Haven, MA 02568

Massachusetts Department of Food and Agriculture
100 Cambridge Street
Boston, MA 02202
(617) 727-3000

Massachusetts Marine Trades Association
P.O. Box 272
Milton, MA 02186

Massachusetts Small Farm Committee
NE Small Farm Institute
Box 937
Belchertown, MA 01007

New Alchemy Institute
237 Hatchville Road
E. Falmouth, MA 02536
(617) 563-2655

New England Farm Center
Hampshire College
Amherst, MA 01002
(413) 253-7065

Rural Education Center
Stonyfield Farm
Wilton, NH 03086
(603) 654-9625

Small Farm Management Assistance Project
Draper Hall
University of Massachusetts
Amherst, MA 01003

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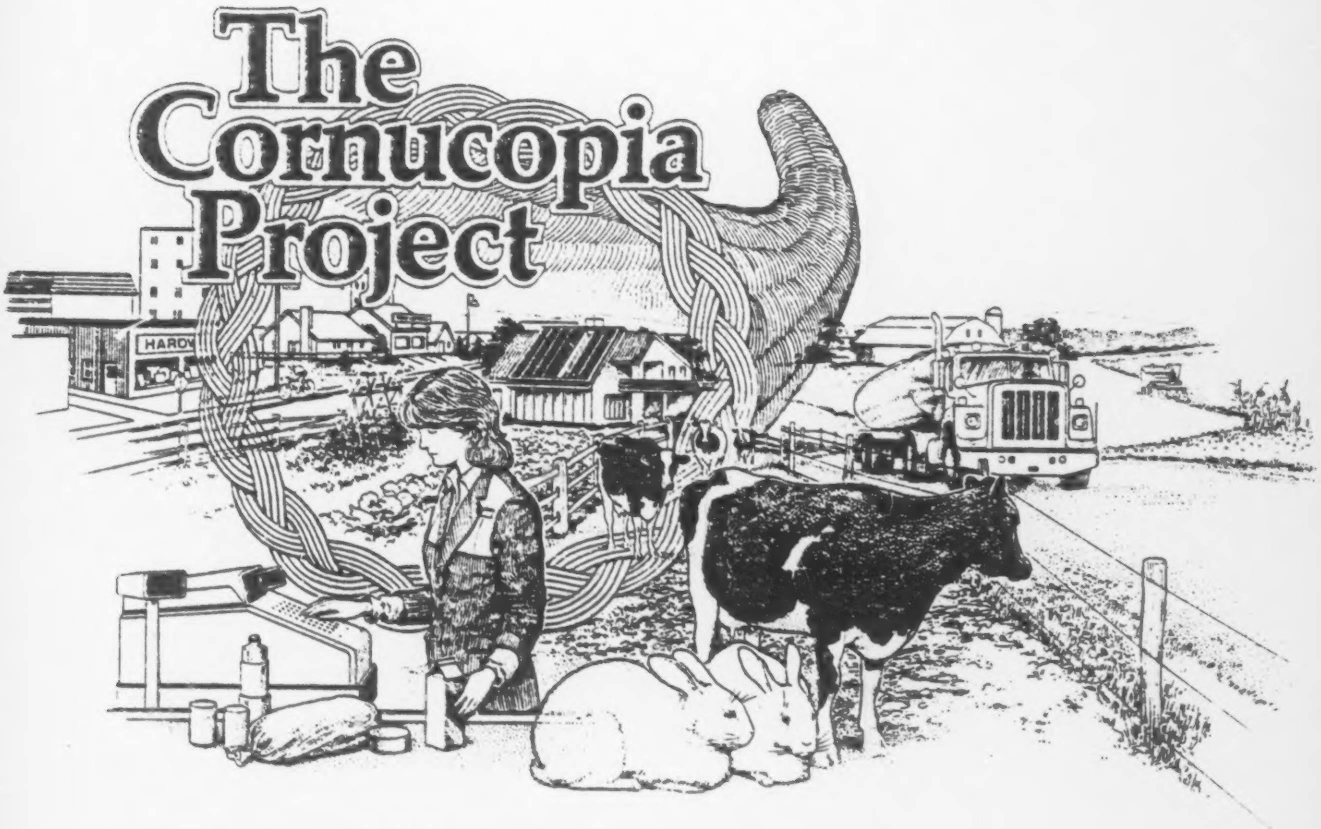

THE FOOD SYSTEM IN CALIFORNIA:
Problems and Prospects in the Land of Plenty

by
ELLEN PAHL
of
The Cornucopia Project of Rodale Press
with the research assistance of Jeff Klein

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March 1983

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PREFACE

The Cornucopia Project of Rodale Press has been examining the food system of the United States on national, state and local levels, looking into, among other things, economic structure, supply vulnerability, soil erosion and compaction, loss of farmers and farmland, farm debt, the use of expensive energy, water, fertilizers and pesticides and their environmental impacts.[1] These concerns threaten the sustainability of our food system and health and well-being of the entire nation. This is a study of California's food system and agricultural industry.

California, the nation's leading agricultural state, plays a vital role in keeping America fed. This report, compiled through extensive research, interviews and consultations is an analysis of the state's food production and distribution system in an era of increasing costs and dwindling supplies of resources. California agriculture and food issues are extremely complex. Books have been written on the economics of California agriculture, on the politics of water and resource management, on labor policy, and on many other issues addressed in this study. We do not expect or hope to have the last word here. Rather, we hope to present a unique way of looking at, thinking about and changing California's food system so that it may become more sustainable.

Many of the understandings and recommendations presented here are based upon the work of people long involved with and committed to California food and agricultural issues. Special thanks go to Gil Friend, Kim Mueller, Len Duhl, Don Rothenberg, Professor George Morgan and Professor Robert Jay.

INTRODUCTION

California's agriculture has been immensely successful. California leads the nation in gross cash farm receipts. Farmers in the state, just 3 percent of the nation's total, received $13.7 billion, 10 percent of the national gross cash receipts from farming in 1980.[2] Approximately 10 percent of what goes into every shopping basket in the country comes from California.[3] The state supplies the nation with 45 percent of its fresh vegetables and 53 percent of processed vegetables.[4] California accounts for 50 percent of the nation's cash receipts for fruit and nuts and 33 percent of that for vegetables.[5] Agriculture in California is considered one of the most diversified in the world, with no single crop dominating the state's farm economy. Milk and cream, the leading commodity in 1980, accounted for only 12.8 percent of the state's total agricultural value. Most crops individually account for less than 2 percent of the state's total gross farm income. California leads the nation in 49 commercial crop and livestock commodities.[6] (See Table 1). That's the good news.

Table 1

CROP AND LIVESTOCK COMMODITIES IN WHICH CALIFORNIA LEADS THE NATION

Alfalfa Seed
Almonds
Apricots
Artichokes
Asparagus
Avocado
Broccoli
Brussels Sprouts
Cantaloups
Carrots
Casaba Melons
Cauliflower
Celery
Chili Peppers
Cranshaw Melons
Cut Flowers
Dates
Eggs
Figs
Garlic
Grapes
Honeydew Melons
Kiwi
Ladino Clover Seed
Lemons
Lettuce
Lima Beans
Mushrooms, F.M.
Nectarines
Nursery Products
Olives
Onions
Oriental Vegetables
Peaches
Pears
Persian Melons
Persimmons
Pistachios
Plums
Pomegranates
Potted Plants
Prunes
Rabbits
Safflower
Spinach
Strawberries
Sugar Beets
Tomatoes, Proc.
Walnuts

Source: State of California, Department of Food and Agriculture, California Agriculture-1980, p. 3.

The bad news is that despite this incredible success, California imports 41 percent of the food consumed by its residents. The transportation cost alone for this imported food is $439 million. While $8.8 billion is spent on food brought in from out-of-state each year, $7 billion actually leaves the state (the other 20 percent stays with California food merchants).[7] In addition, the huge surplus which California exports each year faces increasingly stiff competition as long distance transportation costs increase. (Truck rates have increased more than 99 percent in the last 15 years.[8]) In addition, other regions of the country are becoming increasingly wary of their dependence on a supply of food that could be disrupted, as the recent independent truckers strike helped make clear.

An overwhelming array of evidence leads to the conclusion that California's present method of producing and distributing food -- the present path from field to table -- is, in the long term, unsustainable. It needs to be altered if California is to maintain the prodigious flow of food from farm to consumer. The drain on water, soil, mineral and energy resources, the dependence on synthetic fertilizers, pesticides, a small genetic seed base, large government subsidies, and the concentration of ownership and control at all levels of California's food system, are fostering conditions which threaten the long-term viability of the entire food system. For example:

* California imports over 40 percent of the food consumed by its residents. 6,854 truckloads of food enter the state each week to supply this food. The transportation cost is $439 million each year.

* California consumers spend about $21 billion for food each year, with $8.8 billion being spent on food brought in from out of state.

* The total transportation bill for all food consumed is $1 billion.

* In the years from 1954 to 1980, California lost 43,000 farms - 35 percent of their total. In 1980, there were only 80,000 farms remaining.

* Farms having sales of $100,000 or more made up only 16.6 percent of all farms, but accounted for 88.9 percent of agricultural sales.

* Six percent of farms control 53.2 percent of the state's cropland.

* One inch of California topsoil is lost roughly every 25 years.

* Each year enough soil is lost to cover the whole length of Interstate Route 5 in California with 32 inches of dirt.

* Every year 55,000 acres of prime farmland -- an area over twice the size of the city of San Francisco -- are converted from agricultural to other uses.

* Nearly 81 percent of California cropland is irrigated, but future water supplies cannot be guaranteed to sustain this level of usage.

* Groundwater reserves in the Central Valley, being pumped for irrigation, are falling at an average of 1.5 feet per year.

* Crop yields in the San Joaquin Valley have been reduced by 10 percent due to the build-up of toxic salts from irrigation problems. These yield losses are valued at $31.2 million annually.

* Soil compaction in California costs approximately $20 million per year in alfalfa yield losses alone.

* California exported 3.4 million metric tons of grain worth $414 million to other countries in 1979 while at the same time 6.8 million tons were imported at a cost of $785 million.

* By 1985, 47 percent of California's competitive crops may no longer be economically transported to distant markets.

* Pesticide use is high -- 113 million pounds of active ingredients were applied in 1981, over 11 pounds/acre. This is considerably higher than the national average rate of 2.3 pounds per acre.

* Pesticides spread on California's cropland amount to 4.7 pounds of active ingredient for each Californian.

California's food sytem affects everyone, Californians, North Americans, and world citizens. This study draws a picture of California's food system and highlights critical areas in that picture. Farmers, consumers, industry and policy makers at the local and state level should be able to use it as a source of information, as a conceptual framework for understanding the state's food system, and as an outline for further work and action.

FOOD IMPORTS/EXPORTS

Considering that California is the leading agricultural state in the United States, it is incredible that over 40 percent of its food comes from other states and countries. Aside from exotic foods such as bananas, pineapples, coffee, and tea, which cannot be commercially grown in California, the major food items brought into the state in 1979 were meats; 97 percent of the pork, 64 percent of the chicken, 52 percent of the beef, 68 percent of the veal, and 30 percent of seafood were imported. There are however, some other more surprising revelations -- 35 percent of the state's sweetcorn was imported as was 15 percent of the fresh snap beans,19 percent of cucumbers, 11 percent of the cabbage and 29 percent of potatoes.[9] These figures are conservative because they assume 100 percent of any particular commodity grown in California stays in California to feed California residents. They do not take into account that some commodities are exported and then imported from somewhere else to feed California residents. Forty-one percent of the 1980 fruit and vegetable unloads in San Francisco and 39 percent in Los Angeles were from out of state.[10] Fresh market tomatoes, cherry tomatoes, green onions, bell peppers and bananas accounted for 62 percent of the imports from Mexico.[11]

Exporting food though is California's specialty. In 1979, 3.4 million metric tons of grain (corn, sorghum, soybeans, wheat) were exported to other countries. The value of this grain exceeded $414 million.[12] While California produced over 4 million tons of its own, 6.8 million tons were brought in from other states to support the cattle, poultry and export industries at a cost of $785 million.[13] California produces relatively little corn, but utilizes large amounts in the cattle, poultry and export industries.

Over 4 million tons of corn alone were shipped into the state (at a cost of over $475 million), an amount nearly equal to all the grain produced in California. The state harvested enough wheat to meet the requirements of the feed and flour industry, but imported 832 thousand short tons to supplement the export trade. This cost the state $108 million.[14]

The value of California's agricultural exports to other countries reached $4 billion in 1980, an increase of 43 percent over 1979. Thirty-six percent of California's harvested cropland, or 3.2 million acres were used to grow food for export. At the farm value, 23 percent of total farm marketings are sold abroad. Without the international market, "California's ranchers and growers would find it difficult to sell all they produce on the domestic market."[15] While this is true for vegetables and fruits, and some other commodities, the state is clearly deficient in grain, livestock feeds and livestock production. They are importing goods from the Midwest and in many cases are then exporting them to East Asia. Surplus commodities produced in California are exported both east (to other states) and west (abroad). The state's growers produce two times more fresh vegetables than consumed in the state, five times more fresh fruits, ten times more rice, and thirty times more almonds and walnuts.[16] (See chart 2).

In 1979, Californians spent a total of $21 billion for food, over $1 billion of which paid the costs of transporting this food into California. This is more than any other state spends. Consumers spent approximately $8.8 billion for food shipped in from outside the state. This requires an estimated 6,854 truckloads of food rolling into California each week. The equivalent of 19,417 truckloads of food leave the state each week.[17] In July of 1982, the cost to ship one truckload of vegetables from the Salinas

Table #2 ESTIMATED VALUE OF CALIFORNIA'S LEADING AGRICULTURAL EXPORTS, VALUED AT PORT OF EXPORTATION CALENDAR YEAR 1980 AND PERCENTAGE CHANGE IN VALUE 1979-1980

Rank	Commodity	Value ($ 000)	Value Change 1979-1980 Percent
1	Cotton Lint	1,135,559	+ 41
2	Almonds	429,817	+ 50
3	Rice	318,808	+117
4	Wheat	283,145	+ 72
5	Grapes (including fresh, raisins, and crushed)	230,864	+ 31
6	Oranges (including fresh, juice, and oil)	177,094	+ 67
7	Lemons (including fresh, juice, and oil)	93,210	- 4
8	Cattle and Calves (including beef, veal, hides, skins, and tallow)	91,762	- 16
9	Walnuts	82,957	+ 51
10	Peaches (including canned and portion of canned mixtures)	75,372	+ 21
11	Prunes	64,861	+ 18
12	Cottonseed (including cottonseed oil)	50,633	+ 32
13	Chickens and Eggs	43,801	+182
14	Tomatoes (including fresh and processed)	43,782	- 13
15	Dairy Cattle and Products	42,277	+ 37
16	Alfalfa (including cubes, meal, and seed)	42,276	+ 27
17	Dry Beans	42,093	+ 69
18	Lettuce	29,740	+ 9
19	Onions	28,497	+ 36
20	Pears (including canned and portion of canned mixtures)	18,477	+ 19
21	Grapefruit (including fresh and processed)	17,821	+ 84
22	Strawberries (including fresh and frozen)	16,374	+ 35
23	Dates	13,444	+ 65
24	Plums	13,278	+ 43
25	Flowers and Plants	13,052	- 8
Remaining Estimated Commodities		71,816	
All Other Commodities		527,013	
TOTAL		3,997,823	+ 43

Source: California Crop and Livestock Reporting Service, Exports of Agricultural Commodities Produced in California, 1980, p. 4.

Valley-Watsonville area of California to New York was $3,100 to $4,200.[18] In the event of any difficulties in the transportation network -- a fuel shortage, truckers strike -- California residents would not starve, but they would have to adopt a radically different diet.

In view of rising energy, water, and mineral costs, other areas of the country may become competitive producers of many commodities now grown exclusively in California. A study by the U.S. Department of Energy concluded that an energy shortage or reduction of just 10 percent would lead to a 55 percent increase in the price of raw commodities.[19] There are several crop and livestock commodities from Table 1 which could easily be produced in other areas of the country, areas much closer to the large, concentrated markets of the East. It makes sense for California to produce and export crops which grow best there, but it also makes sense for the state to begin producing more livestock and poultry to meet its own consumption needs. This would not detract from the state's agricultural industry or general economy since every dollar of output from the livestock sector of farming generates $2.78 of total product throughout the economy on its way to final consumption. Every dollar of output from the crop sector generates only $1.81 of total product.[20] From this perspective it is clear that it would be to California's economic advantage to produce more livestock for local, in-state consumption. As an added benefit, the additional animals would produce manure thereby cutting expensive fertilizer costs.

A recent study done within the California Department of Food and Agriculture determined the impact of rising transportation costs due to increased fuel costs on the state's fresh fruit and vegetable production.

The model indicates that 47 percent of California's competitive crops, those fruits and vegetables which are also grown in other areas of the country, will no longer be transported to markets by 1985 when diesel fuel reaches the projected price of $1.73 per gallon (1982 $). This was before the recent vehicle operating taxes. The costs of operating a truck are now such that this condition could happen sooner. A reduction in quantities shipped will occur prior to 1985. Rising energy prices will have little or no effect on the demand for monoply crops however -- those crops which California produces exclusively, or crops in which California has a seasonal advantage.[21]

Economics are having a big impact on the California growers and shippers. The market for California tomatoes in the summer of 1982 was at rock bottom. California tomatoes were just not moving. Many shippers who have been around for years had never seen such a prolonged period of poor prices. The packers were waiting for rain or cold weather to knock out local production in the East, while some California growers were junking their fields.[22] Lettuce prices also hinge upon East Coast demand. Some days shippers do not break even especially when lettuce is ready to be cut, but is scheduled to arrive in the East 5 to 7 days later on a Saturday or Sunday when few customers want it.[23] While the Salinas Valley is ideal for growing iceberg lettuce, other regions of the country are capable of growing much more lettuce and other greens for a longer portion of the year.

Livestock/Poultry

A seriously weak link in California's food production chain exists in the area of livestock and poultry. These commodities account for the bulk of food (77 percent) brought into the state in 1979.[24] As Table 3 indicates, California imported 1,333,000 head of cattle in 1980, most to be fattened for slaughter using imported feed grains. There was a significant increase (11 percent) in broiler and fryer production in the following year,[25] but as Table 2 illustrates, much of this extra production was exported. Agriculture officials believe the opening of new markets abroad for chicken and eggs in particular, stabilized the market and prevented a domestic supply disruption.[26] It is ironic that the increased production was not able to help meet local demand.

In 1978, the Department of Water Resources investigated the future of the livestock and poultry industries in California to see what influence this would have on the demand for the feed and forage crops grown to support these industries. While the economics and transportation costs of that time seemed to favor the importation of meat from the Midwest, the state does have numerous advantages which will favor increased meat and poultry production within the state. California's weather will contribute to lower production costs in buildings and heating. The state also has byproducts unavailable in other states which can be utilized as feed. There is an enormous amount of rangeland for grazing and high quality labor available to California producers. Local producers and distributors could better meet the needs of customers and could handle fresh deliveries which distributors in Minnesota or Arkansas, for example, could not do.[27]

LAND USE/SOIL ABUSE

Soil is the basic growing medium, the site of chemical and biological interactions which support and sustain agricultural productivity. California

Table #3

-- CATTLE AND CALVES: Number shipped into California, by state of origin, 1979-80

State	All purposes		Stockers and feeders		Immediate Slaughter	
	1979	1980	1979	1980	1979	1980
	Number of Head					
Arizona	500,000	343,000	323,000	211,000	177,000	132,000
Colorado	11,000	23,000	9,000	12,000	2,000	11,000
Florida	37,000	20,000	37,000	20,000	---	---
Idaho	70,000	53,000	57,000	41,000	13,000	12,000
Louisiana	19,000	8,000	19,000	8,000	---	---
Mississippi	12,000	17,000	12,000	17,000	*	---
Montana	23,000	8,000	20,000	4,000	3,000	4,000
Nevada	130,000	124,000	88,000	78,000	42,000	46,000
New Mexico	22,000	13,000	21,000	12,000	1,000	1,000
Oklahoma	10,000	18,000	10,000	18,000	---	---
Oregon	248,000	178,000	222,000	150,000	26,000	28,000
Texas	525,000	445,000	525,000	443,000	*	2,000
Utah	52,000	35,000	40,000	15,000	12,000	20,000
Washington	19,000	13,000	13,000	8,000	6,000	5,000
Wyoming	17,000	10,000	12,000	5,000	5,000	5,000
Other	49,000	25,000	49,000	23,000	*	2,000
TOTAL	1,744,000	1,333,000	1,457,000	1,065,000	287,000	268,000

* Less than 500 head.

Source: California Crop and Livestock Reporting Service, California Livestock Statistics 1980, p. 9.

has just over 10 million acres of cropland,[28] 6.5 million acres of which is prime farmland.[29] Each year, 55,000 acres of this prime farmland are converted from agriculture to other uses.[30] This is an area over twice the size of the city of San Franciso that is lost each year to development. The total loss of all agricultural land to urbanization is estimated at 150,000 acres per year, over 2½ times the area of Redwood National Park.[31] With California's current population growth, demand for land and housing will continue to grow. In 1950, the population was 10.5 million. At the most recent count in April 1980 there were roughly 24 million Californians, at a density approaching 150 people per square mile. At this growth rate, California's population will reach over 31 million by the year 2000.[32]

Nearly 81 percent of the total cropland in California is irrigated.[33] While irrigated prime acres lost to development are offset by new acreage brought under irrigation, there is a qualitative difference between the prime land that is lost and the inferior land that is gained. The prime land uses water and resources more efficiently, is usually closer to urban population centers, and produces higher yields. Seventy-five percent of the land newly irrigated over the past five years is medium and low potential Class III and Class IV land.[34] This land requires greater quantities of fertilizer to produce its yields, and providing these marginal lands with water is both difficult and expensive. California's agricultural regions are unusually varied and some special growing areas are irreplaceable. New agricultural districts will not continue to appear forever. Some crops which grow only in limited areas "could disappear from California agriculture in a shockingly short time."[35]

In the San Francisco Bay Area, about 708,000 acres of agricultural land have gone out of production since 1949, and another 19,000 acres -- a chunk two thirds the size of San Francisco -- shuts down each year. If this trend continues, farming in the Bay Area will be eliminated within 40 years. This vanishing farmbelt is vital to both the biological and economic security and stability of the Bay Area. Farms and ranches in the nine Bay Area counties produce $750 million worth of crops, employ 60,000 people, and add an estimated $2 billion to the regional economy. The farmbelt provides Bay Area residents with fresher, less expensive food than could be provided by distant farms in irrigated deserts. It also cleans the air and provides an efficient use for treated wastewater, and creates a healthy atmosphere for recreation and community life.[36]

In addition to losing productive agricultural land to other uses, California is losing the productive capacity of its soil to desertification, compaction, and erosion. California's soils are an extremely fragile and vulnerable resource. Its climate and soil are the same as the Mediterranean region, where civilization declined in history due to severe degradation of the lands. Many observers attribute this decline to soil erosion, deforestation, overgrazing and mismanaged irrigation. The natural rate of topsoil formation in California is estimated on average to be about one inch per 2000 years.[37] In intensively farmed acres however, conditions for natural soil formation do not even exist today. Organic matter is not being added to the soil as rapidly as it would be under natural conditions. It is estimated that soil is being lost to wind and water erosion at a rate of

6 to 6.5 tons per acre statewide. This means that one inch of topsoil is lost roughly every 25 years.[38] Since topsoils vary in thickness from several feet to only a few inches, this loss may be expected to cause severe problems in many areas of California in the not-too-distant future. At the erosion rate of 6 tons of soil per acre, California's cropland loses a total of 60 million tons of soil each year. This is enough to cover the length of Interstate Route 5 in California with 32 inches of topsoil. Along with this lost soil, 250 million pounds of nitrogen and 62.5 million pounds of phosphorous are washed away each year. This is over 20 percent of the nitrogen and 37 percent of the phosphorous that farmers applied in 1979, and has an equivalent fertilizer value of $50 million.[39]

There are 1.9 million acres of California's irrigated croplands which are exhibiting signs of desertification. The increase in soil salinity due to drainage problems and the build-up of toxic salts presently reduce crop yields by 10 percent in the San Joaquin Valley. Poorly drained acres cause yield losses valued at $31.2 million per year. By the year 2000, losses are expected to reach $321 million annually (1978 dollars).[40]

Soil compaction from heavy machinery adversely affects soil productivity and is a widespread problem in California. Most California soils have less than 3 percent organic matter and are very susceptible to compaction. It seriously affects 2.4 million acres of cropland and over 500 thousand acres of pasture and rangeland. Increased soil density and decreased soil aeration due to compaction interfere with the entrance of water and air into soil pores, inhibiting the growth of healthy root systems. Soil compaction in California costs approximately $20 million per year in alfalfa yield losses alone.[41]

In California, 9.5 million acres of land have water erosion problems, of which 2 million is cropland and 6.2 million is rangeland. One study estimated the cost of losses in soil, land productivity and public facilities was $16 million annually.[42]

Wind erosion in California is considered to be less important than other soil problems, but a large area of the state is subject to wind erosion. Over 7.5 million acres of rangeland including the seasonal rangeland of the Mojave Desert are susceptible to wind erosion. Extreme winds and windstorms are not unusual in many parts of California.[43] In 1977, the windstorm near Bakersfield removed 167 tons of soil per acre from a 230-square-mile-area of overgrazed rangeland. The value of nutrients lost was estimated at $24 million. Some storms take as much as 400 tons per acre at a cost of $800 per acre in nutrients.[44] Each acre-foot of soil stores about 8,000 pounds of nitrogen and 2,000 pounds of phosphorous. These fertilizer nutrients have the equivalent fertilizer value of $1,600 per acre-foot.[45] Water storage capacity is lost in eroded and compacted soils as well, adding to the loss of soil productivity.

WATER

As a resource and as an issue, water assumes almost religious proportions in California. Due to the harnessing and application of water, California's semi-desert Central Valley has been converted into North America's most varied and productive agricultural region. "Water is the life blood of agriculture, California's largest industry. Assuming that approximately 1,600 pounds of food are produced to supply the 1,500 pounds consumed annually by a typical person, and that an average of 1,000 gallons of water are needed to produce each pound of food, then it takes about five acre-feet of water to produce the food the average American consumes each year."[46] One acre-foot of water is approximately the amount of water used by an average family of five in one year, including lawn and garden irrigation.[47] California uses over 18 trillion acre-feet of water to produce the 30 billion tons of food it produces yearly.[48] By the year 2000, food production is projected to increase about 30 percent.[49] The importance of water in insuring adequate food cannot be overemphasized.

Unfortunately, water is far from abundant in California and it may prove to be the limiting factor in current agricultural production. Most of the agricultural regions in California depend upon irrigation water transported from other parts of the state or from the Colorado River. The production of one pound of the following food and fiber products under irrigation in California requires: 168 gallons for corn, 914 gallons for sugar, 565 gallons for rice, and 2044 gallons for cotton.[50]

California is facing severe, chronic shortages of water. It has been estimated that there is right now a shortage of 3 million acre-feet in California.[51] That's enough water to supply 15 million people with all their water needs for a full year. Beginning in 1985, the Metropolitan Water District in southern California will gradually lose 1.2 million acre-feet of the water it now gets from the Colorado River each year, as Arizona stakes its legal claim to this water.[52]

A shortage of water costs hundreds of millions of dollars in agricultural losses. It is estimated that the drought of 1976 cost 1.3 billion dollars in crop losses and emergency expenses.[53] In Marin County, livestock ranchers were especially hard hit by the drought. More than 41 million gallons of water had to be hauled to ranchers at a cost of $65,000 during the drought, and $953,000 was spent to pay for feed and fodder shortages.[54] There are other costs not directly related to agriculture which have to be considered: the need to import more oil due to lack of water to generate hyro-electric power, the extension of the fire season, and the restriction of camping and timber harvesting.

Depletion of surface water supplies and increasing demand for irrigation water have led many agricultural users to turn to groundwater supplies. These, because they are being pumped at rates quicker than their recharge, are being depleted at alarming rates. In the Central Valley, groundwater supplies are falling at an average of 1.5 feet per year. In the 1976 drought, groundwater reserves fell 7.5 feet.[55] Groundwater mining, which is what is occurring in the Central Valley, either exhausts the supply of water, or lowers the water table so far that the cost of pumping water eventually makes irrigation economically impractical.[56] Groundwater mining can also cause subsidence, the settling of the land as water is pumped from the ground. In the San Joaquin Valley, the land has already settled 29.5 feet. Once it occurs, subsidence is irreversible and may result in sufficient stress to cause faulting.[57] Also, as the soil settles, it becomes compacted, irreversibly losing its water storage capacity. This is exactly what happened in the Tigres-Euphrates Valley of Mesopotamia.[58]

Irrigation causes other serious problems. Over 2 million acres of

California crop, pasture and range land are affected by salt build-up.[59] When irrigation water evaporates it leaves behind salts and other minerals in the soil which reduce crop yields. A major study by the Interagency Drainage Program in 1979 concluded that, "high, brackish water tables now underlying about 400,000 acres of irrigated farmland in the San Joaquin Valley pose an increasingly serious threat to productivity. Ultimately, more than a million acres will be similarly affected."[60] The San Joaquin Valley is like a big basin covered with a thin layer of productive soils. The bottom of the basin is dense, non-porous clay which has been holding all the salty run-off irrigation water which has percolated through the thin agricultural crust. If this water continues to build up, which it will unless somehow removed, it will eventually waterlog the whole valley with salty water, destroying its agricultural potential.

The problems of water depletion, soil salinization, and waterlogging promise to be expensive and complicated to remedy. To drain the San Joaquin Valley would require over $1 billion worth of drains, pumps and holding ponds,[61] and neither of these figures include environmental costs and losses to the fishing and tourism industries.

Despite the scarcity of water and the projected expense of procuring new sources, water is still unbelieveably inexpensive and regularly wasted. For example:

* A 1976 U.S. General Accounting Office study found that more than 50 percent of all irrigation water is wasted.[62]

* About one-quater of the 1.2 million acre-feet of water in the Coachella Canal is lost to evaporation and seepage.[63]

* A 1978 Rand study estimated that California is losing between $60 and $370 million annually from inefficient use of water.[64]

* Los Angeles cleans up only 60,000 acre-feet of its 550,000 acre-feet of reuseable wastewater.[65]

Water is being squandered so readily partly because water users, particularly agricultural users, who account for 87 percent of California's water use,[66] are paying outrageously low prices. They are, in effect, being subsidized by the California and U.S. taxpayers. In some cases, the replacement cost of water is 50 times more than what farmers are paying. In the Central Valley, for example, farmers pay as little as $3.50 an acre-foot for their irrigation water. If priced to cover construction, operating and maintenance costs, water from new federal projects would cost at least $160 per acre-foot -- over 45 times the $3.50 currently being paid.[67] The Department of Interior says the federal subsidy to agriculture is worth about $1,500 per acre per year in the Westlands water district, or $3.4 million for a typical 2,200 acre farm. In the Central Valley the subsidy is worth about $1,100 per acre per year, or $2.7 billion for the entire area.[68] This "socialism for the rich " is, in the long term, debilitating to California's entire economy and the agricultural economy in particular.

As Table 4 indicates, the crop which covers the most irrigated acreage and which uses the most irrigation water is alfalfa, a feed crop for livestock. Grain, hay and pasture used exclusively for animal feed, accounted for 42 percent of the state's water demand in 1975.[69] Rice uses tremendous amounts of subsidized water yet most rice grown in the state is exported to Asia.[70]

Table #4

Comparative Values in Agricultural Production

CROP	IRRIGATED ACREAGE (Acres)	Percent	APPLIED WATER (acre-feet)	Percent	TOTAL VALUE TO PRODUCER (Dollars)	Percent
Alfalfa (hay and grain)	1,341,175	47	6,732,100	54	251,580,000	27
Cotton (lint and seed)	961,700	34	3,874,700	31	305,937,000	33
Grapes (all types)	544,805	19	1,903,350	15	368,106,000	40
	2,847,680	100	12,510,150	100	925,623,000	100

Alfalfa, cotton, and grapes were the top three crops in California in 1972 in terms of irrigated acreage, water consumed, and total value yielded to the producer. Together, these three crops accounted for nearly one-third of the irrigated acreage and applied irrigation water used by the 200 commercial crops California produces. As the table illustrates, however, the crops which occupy the greatest acreage and consume the largest volumes of water are not necessarily those which yield the highest value to the producer.

Source: California Department of Water Resources, The California Water Atlas, (Los Altos: William Kaufmann, Inc., 1978), p. 1.

This does not seem to be the most efficient way to utilize scarce water resources, nor does it seem the best way to use prime agricultural land. Crop selection, land quality, and irrigation and farming techniques all affect the efficiency of water use. Raising livestock on crops produced from irrigated land or on imported grain is a very inefficient use of limited water resources. Producing grass-fed livestock is more efficient. To produce 1 pound of grain-fed meat requires 500 to 1000 gallons of water, including the water input for irrigated grain.[71] Also, crops grown under arid conditions use 20 to 40 percent more water than they do when grown under normal conditions.[72]

Water project development is critically important to large landowners and farm operators. The large-scale farms which produce over 88 percent of the market value of the state's agricultural products have economic and political power to influence public policy. Currently, eight landholders in Kern and Kings Counties receive 40 percent of the State Water Project water from the Metropolitan Water District. These include Chevron U.S.A., Inc. (37,793)acres, Tejon Ranch Company (35,897 acres), Getty Oil Company (35,384 acres), Shell Oil Company (31,995 acres), McCarthy Joint Venture A (25,105 acres), Blackwell Land Company (24,663 acres), Tenneco West, Inc. (20,180 acres), and Southern Pacific Land Company (16,528 acres). These eight landholders control 74 percent of the vineyards, 71 percent of the orchards, 54 percent of the row crops, 72 percent of the grazing crops and 54 percent of the undeveloped land in the area receiving surplus water from Metropolitan Water District.[73] The charges to these growers for surplus water is as little as one seventh of the retail price paid by southern California customers.[74] Others estimate that agriculture pays $3 to $5 an acre for water while southern California residents pay $150 to $200 per acre.[75]

The Federal Reclamation Act of 1902, which is the forebearer of most of the federal water projects in California, explicitly limits the amounts of subsidized water any individual landholder can receive. Through failure of enforcement and through complex leasing arrangements, the 160-acre limitation, as it is called, exists only in name as single operators continue to hold thousands of federally-irrigated acres.[76] Recently, Congress voted to amend the 1902 Reclamation Act. The new bill substantially raises acreage limitations and removes residency requirements. While it does require large landholders to pay the "full" price for water, the formula which determines "full" price is believed by family farm advocates to be inadequate. This reform of an 80-year-old law designed to help small family farmers has cleared the way for large landholders to consolidate and increase their holdings.[77]

There is no acreage limitation attached to the use of water from the State Water Project (SWP) either, and small-scale farmers have been affected by the project's price structure. SWP water prices, quite a lot higher than federally subsidized water, require production of high-value crops to generate sufficient return. The substantial investment required for orchard and vineyard development is beyond the capital resources of most small-scale farmers.[78] An acre of land planted to English walnuts in the San Joaquin Valley had a market value of $8,780 in April 1982, while an acre of navel orange groves was worth $7,260.[79] Growers must possess substantial resources to obtain loans from banks and lending institutions.

Conflicts for water will increase as the competing demands for energy, industry and food production rise. Agriculture currently consumes 83 percent of the water withdrawn in the United States and an increase of 17 percent is projected by the year 2000. A major synthetic fuels program could increase water consumption for energy production four to thirty-fold over present levels. The major portion of this growth would occur in western states, and industrial uses of water will most likely be more profitable than agricultural uses.[80]

FARM SIZE, NUMBERS, OWNERSHIP

California is losing its farmers as land is becoming owned and operated by fewer and fewer large firms. In 1980, California had 80,000 farms, compared with over 123,000 in 1954. In just 26 years, the state lost 35 percent of its farms. Average farm size in this period however increased 38 percent, from 307 to 424 acres.[81] This indicates a trend toward fewer, larger farms with increasing concentration of power over the food system in the hands of fewer individuals or agribusiness corporations. According to the 1978 Census of Agriculture, 6 percent of farms conduct operations on 53.2 percent of the state's cropland. The largest 211 farm operators have average holdings of 11,500 acres of cropland each.[82] Farms having sales of $100,000 or more made up only 16.6 percent of all farms in 1978, but accounted for 88.9 percent of the total market value of agricultural products sold.[83] This concentration of land and market share in the hands of large-scale operations puts other farmers, both small and medium-sized, at a disadvantage in a system oriented toward serving large producers.

Large landowners and agricultural operators have significant competitive advantages over smaller operators. In addition to direct and indirect government support through irrigation water subsidies, marketing orders, landgrant colleges, etc., large operators can buy supplies in bulk at discount rates; they are granted lower interest rates; and they can depend on receiving credit and on selling their products. Commercial banks, producers' credit associations, and insurance companies all favor large, high-equity farmers who grow established commodities and can generate sufficient income to pay high interest rates. Smaller farmers must often resort to off-farm sources to supplement their income. In 1978, 59 percent of California farmers reported receiving outside income. Only 49 percent of farm operators listed farming as their principal occupation.[84]

While "bigness" in terms of sales, land holdings, equity, subsidies, etc. is definitely a problem in California, small farms actually outnumber the large farmers. It's just that most of the money goes to large farms. Corporations make up only 5 percent of California's farms; 81 percent are owned by individuals or families. Seventy-four percent of California farmers work less than 180 acres and 60 percent of the total farm less than 50 acres.[85] These small farms contribute significantly to agriculture in the state, producing 72 percent of the agricultural products sold in California. Defined as having less than $40,000 annual income from sales of agricultural products or having 1 to 49 acres of harvested cropland, small farms account for 58 percent of all farms in California. In San Diego County, 94 percent of harvested cropland is on farms having 1 to 49 acres. Ninety-seven percent of the value of agricultural products sold in Trinity County and 33 percent in the Imperial Valley is produced by small farms.[86]

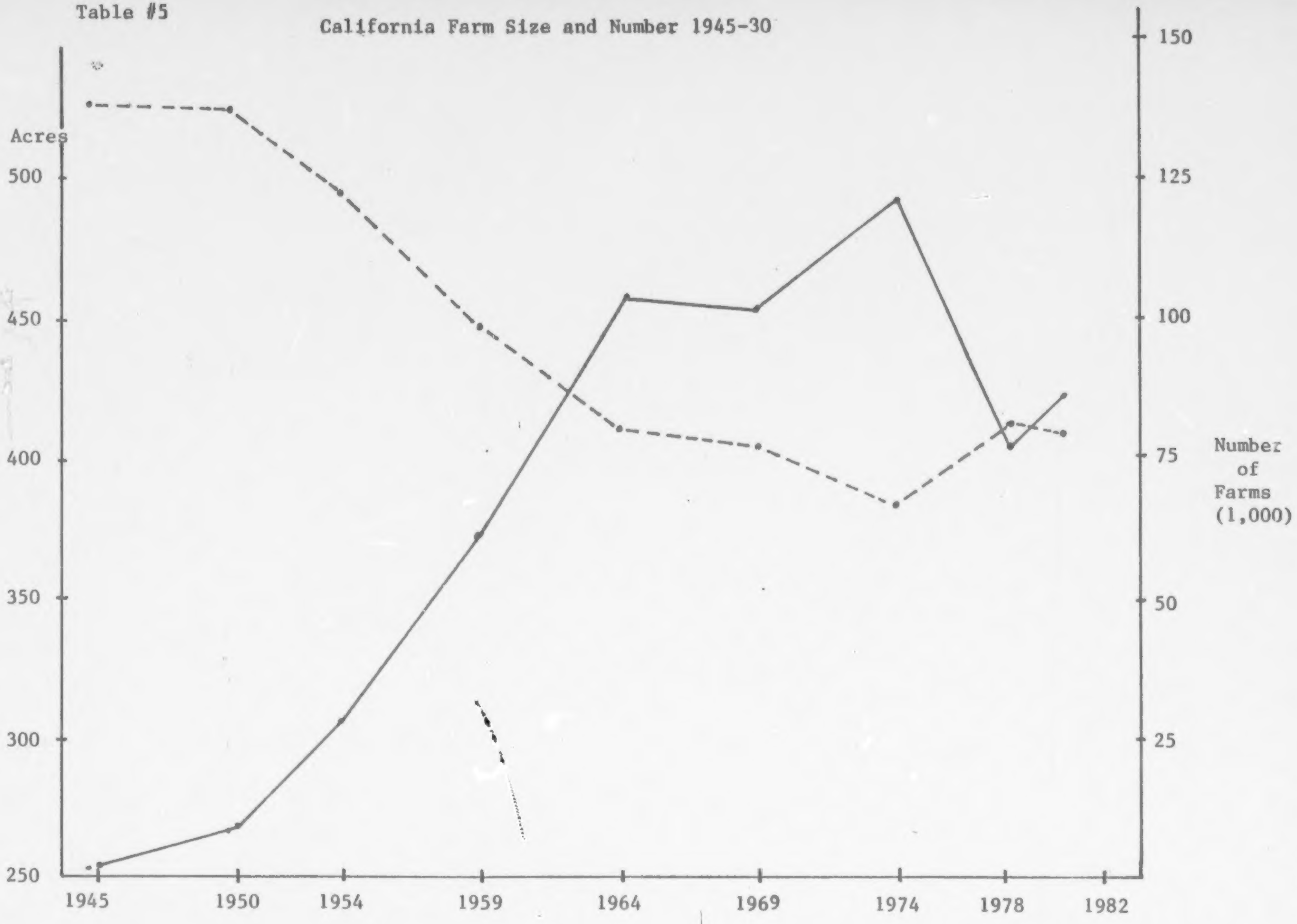
The first study relating farm size to community vitality was made in California in 1946. The study concluded that the community supporting smaller scale farm enterprises was healthier in terms of social, cultural and economic conditions. A 1977 follow-up of this work found that the results were still valid. The town characterized by smaller farms and greater proportion of owner-operated farms had a less divided class structure and higher median family income. The community services were superior, the retail economy was more sound, and the growth rate had been faster and steadier than the community supporting large-scale agriculture.[87]

While several studies on economies of size have been conducted in California, most were done in the 1960's under quite different conditions than exist in the 80's. Most studies showed that for a specific farm type, - average production costs declined rapidly at first but leveled off at medium-sized farming units. Further increases in size did increase income, but did not decrease per unit costs. Costs per dollar of sales decrease and level off at or well below the 320 acre size for nearly all California crops (fruit and nut farms, vegetable farms, cotton, cash grain, sugar beets, hay and other field crop farms).[88] A recent USDA report also concludes that farms reach efficiency at small or modest sizes and that "many commercial farms now exceed the size necessary to achieve all available cost efficiencies."[89] In light of these studies, smaller, family operated farms, of a size large enough to obtain essential economies of scale, provide a wider range of benefits to a greater number of people.

Large California farms may be even more vulnerable than their national counterparts as energy and other input costs rise. Energy costs per acre

Table #5

California Farm Size and Number 1945-30



Source: U.S. Department of Commerce, Bureau of the Census, 1978 Census of Agriculture, 1, Part 5, California, (Washington, D.C.: Government Printing Office, June 1981), p. 1.

for large California farmers ($100,000 of sales and over) are substantially more than for comparably sized U.S. farms. However, per acre energy costs for intermediate and small sales classes are lower than the national average. This same pattern holds true for fertilizer purchases.[90]

Farming is not just a business for farm families; it is a highly cherished way of life. A report of the Small Farm Viability Project (1976-77, University of California at Davis) presented survey results from a questionaire administered to 74 small farm operators. Only 40 percent of the respondents said they received adequate return on labor and capital resources while 89 percent said farming provided a satisfactory quality of life.[91]

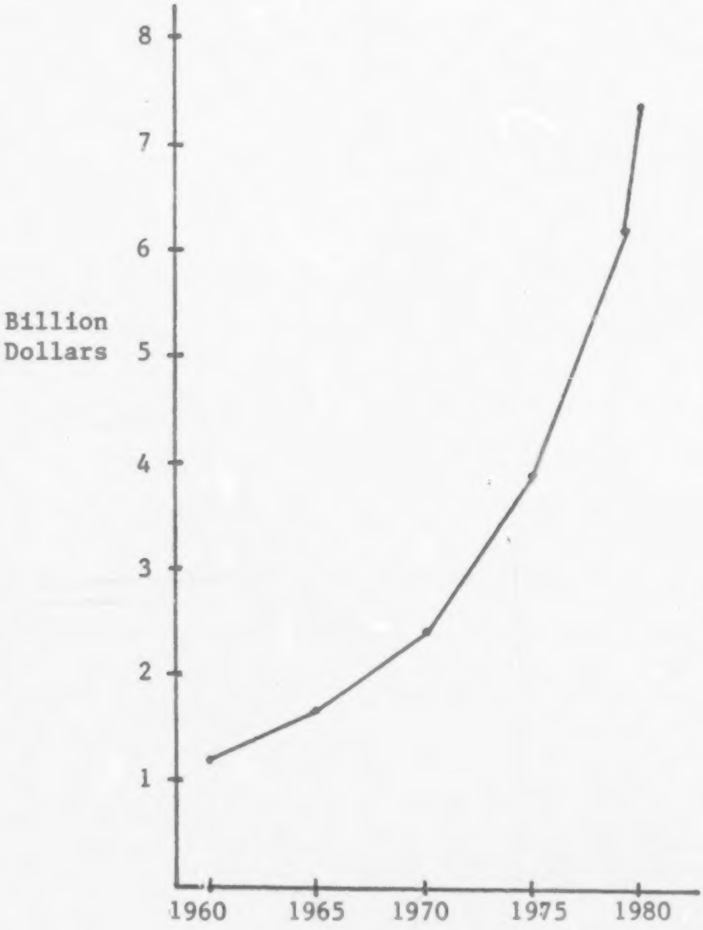
ECONOMICS OF FARMING

California farmers lead the nation in many things, including debt. Total farm debt in the state increased 78 percent in the four years from 1977 to 1981, rising from $8.032 billion to $14.32 billion. Farm real estate debt climbed 70.1 percent in the same period and in 1980, California farmers paid $634 million just for interest on their farm mortgages. Total interest payments in 1980 came to nearly $1.3 billion, over $16,000 per farm.[92] These rising costs coupled with stagnating farm prices and high interest rates have created a vicious cycle for farmers.

The increasing capital-intensiveness of farming makes it especially difficult for aspiring entrants to become established as farmers. In California about 2 out of every 3 farms sold are purchased by farmers who are expanding their current operations.[93] Most young families or workers do not have the equity to compete successfully for the financing needed to capitalize a new farm. In 1982, one acre of California irrigated land for

Table #6

California Farm Real Estate Debt 1960-80



Source: U.S. Department of Agriculture, Agricultural Statistics 1980 (Washington, D.C.: Government Printing Office, 1981), p. 477.

truck and vegetable crops was worth $3,650 in the Sacramento Valley, $4,570 in the San Joaquin Valley, and $6,600 in the Southern region. These values reflect rises of 283 percent and 313 percent since 1974 in the Sacramento and San Joaquin Valleys.[94]

None of California's farmers are exempt from financial pressures of mounting debt, high interest rates, increasing costs and sluggish product prices, and many are in serious trouble. Various management techniques are being used by the numerous small farmers to weather the current economic crisis. There is a higher incidence of off-farm employment to generate capital and to provide a cushion for hard times. In 1978, 40 percent of all farm operators worked 200 or more days a year off the farm.[95] Many small farms are financing costs from cash flow and savings rather than borrowing. Other small farms depend exclusively on family labor to minimize labor costs. While extension advisors expected few bankruptcies in 1982 - and expect very few small growers to leave farming, the belt-tightening and cost-cutting cannot continue for long.[96]

Total current farm operating expenses in California rose 9.4 percent in one year from 1979 to 1980 and have risen 41 percent since 1977. Hired labor is the largest variable cost for California growers and ranchers, making up 27.5 percent of total operating expenses for 1980.[97]

Overproduction is a major factor contributing to the low prices paid to farmers. Surpluses and an enormous abundance of grains and dairy products have caused prices to drop to record lows. Despite this, there is continued expansion of irrigated cropland in California. From 1974 to 1978, there was an increase of nearly 855,000 acres of irrigated land.[98]

This amount of land is nearly enough to double California's vegetable production. (In 1980, the state's 12.4 million tons of vegetables were grown on 875,856 acres.)[99]

FERTILIZERS

California farmers applied over 2.45 million tons of fertilizers (840,000 tons of primary nutrients) to agricultural land in 1979, which cost them $361.1 million.[100] From 1977 to 1980, fertilizer and lime expenses rose nearly 52 percent, and accounted for 44 percent of total 1980 farm production expenses.[101] Spread over 10 million acres of cropland, farmers spent an average of $50 per acre for fertilizers.

Increased fertilizer application can lead to increased production, but many farmers routinely apply far more fertilizer than the soil needs or the crops can use. In a 1981 survey of soil testing labs, many labs gave widely conflicting results even though they were all given the same Pennsylvania soil to analyze. Some labs reported inadequate fertilizer levels and recommended large fertilizer dosages while others showed adequate levels of phosphorus, potassium, or nitrogen for the same fields, but still recommended increased fertilizer applications. Residual levels of potassium, phosphorus, and nitrogen in soils are frequently overlooked or ignored, leading to additional applications of fertilizers that increase the farmers' production costs, but give no appreciable increase in yields.[102] An Agricultural Research Service report also indicated that recommended nitrogen fertilizer rates for fertile soils may be too high. Soil test laboratories must take into account the conversion of nitrogen in soil organic matter into mineral form that occurs throughout the crop season. Slashing fertilizer rates in many cases could not only save farmers money, but could also reduce pollution of groundwater by nitrates.[103] In many cases, farmers may be increasing their production costs unnecessarily. And because fertilizers are the most energy-intensive agricultural input, over-application results in wasted energy as well as wasted money.

A high dependence on chemical fertilizers means dependence on a diminishing mineral base, resulting in increased imports of phosphate, anhydrous ammonia (for nitrogen), and potash (for potassium). U.S. supplies of phosphate are expected to dwindle rapidly after the year 2000. At that time, 90 percent of our potash is expected to be imported. Anhydrous ammonia is made from a process that uses natural gas, another limited and expensive resource.[104] Once natural gas prices are decontrolled, the Fertilizer Institute believes natural gas will be too expensive to use as a feedstock for fertilizer.[105]

PESTICIDES

Remember the medfly? California launched a veritable war on this tiny insect in 1981, flying night raids to poison the bug out of the state, setting up barricades at ports, and establishing quarantines to protect the rest of the nation and to preserve the credibility of the state's agriculture industry. Nearly $100 million was spent in California to control and eradicate the medfly which was present mainly in suburban areas and backyard fruit trees. (Commercial orchards routinely spray to eliminate any pests.) The bulk of the money was spent on spraying a molasses-like bait laced with the insecticide malathion from helicopters and fixed-wing aircraft.[106]

The medfly is now considered to be eradicated in California and while there have been no real lasting effects that have come to light yet, the situation did demonstrate the potential havoc one small insect could wreak on the state's agricultural industry. The 396 medflies found between June 1980 and July 1982 caused a Japanese embargo of California produce, attempted embargos by Texas, Florida and other states, and produce from quarantined areas to be fumigated or refrigerated before acceptance.[107]

Pesticides have enabled farmers to increase output and efficiency but their use has resulted in adverse side effects on people and the environment. In California, attempts have been made to monitor pesticide use by requiring all growers, licensed pest control operators, State, Federal and local agencies to register with the Department of Food and Agriculture. Statistics are kept on each chemical -- the commodity upon which it is used, the number of applications, quantity used and the number of acres covered. The use of toxic restricted materials requires permits and records are kept of all applications of these chemicals. The Department publishes quarterly reports and annual summaries detailing exactly what chemicals are used on various commodities. California is the only state with its own regulatory agency and its standards are tougher than those at the federal level.

In 1981, total usage reported was over 113 million pounds of active ingredient, down 6.6 percent from 1980.[108] If spread evenly over California's 10 million acres of agricultural land, this is over 11 pounds active ingredient per acre, considerably higher than the national average rate of 2.3 pounds per acre.[109] This is enough for 4.7 pounds for every Californian. Nationwide, pesticides account for 3 percent of farmers' total production expenses. They make up 3 to 15 percent of the total costs for most major field crops however, and this portion is even greater for fruits and vegetables.[110] At the 3 percent rate, pesticide costs for California would have been $303 million in 1980.[111] On a per acre basis, pesticide costs for rice in California were $19.86 in 1979, rising 16 percent in 1980 to $23.04. With 548,000 acres harvested in 1980, total pesticide costs to rice growers was an estimated $12.6 million. Pesticide costs for cotton rose 22 percent from 1979 to 1980. California's 1.5 million acres of cotton received applications of pesticides costing $53.8 million.[112]

Whether farmers can continue to spend this kind of money on pesticides is uncertain in light of projected future cost increases. Besides dollars spent by farm operators, other costs are involved. These include human pesticide poisonings and fatalities, reduction of fish and wildlife populations, livestock losses, destruction of susceptible crops and natural vegetation, honey bee losses, destruction of insects' natural enemies, pesticide resistance in target populations and secondary pest problems created by the use of pesticides.[113].

Pesticides reduce environmental quality and influence ecosystem functioning by reducing species diversity. Food chains are modified; patterns of energy flow and nutrient cycling are altered; soil, water and air quality are reduced as is the stability and resilience of ecosystems. It is estimated that as little as one percent of applied pesticides reach the target organisms. Most reach nontarget sectors of the agroecosystem and/or spread to surrounding ecosystems.[114] Crop ecosystems are particularly susceptible to pesticide stress since they often lack a variety of flora and fauna. Orchards, cotton, corn, soybean and vegetable systems are most vulnerable.[115]

U.S. crop losses without the use of pesticides have been estimated to increase from the current 33 percent to 42 percent. No serious food shortage would occur, but production of certain fruits and vegetables would be greatly reduced.[116]

FOOD INDUSTRY

Agriculture, food processing, distribution and marketing constitute California's largest and most important industry. Directly or indirectly, the food industry is responsible for one out of every 3 jobs in the state.[117] Nationwide, the USDA estimates that the food industry employs one out of four workers.[118]

In 1977 there were over 2,600 food and beverage manufacturing plants in California.[119] Of these, the fruit and vegetable canning industry makes up 55 companies and 90 canning plants. There are about 25 freezing companies, half of which account for the major portion of the industry. Others are very small companies or deal with specialty items.[120]

While California does supply the United States with 45 percent of its fresh vegetables, approximately 29 billion pounds of additional vegetables and fruits remain in the state to be canned or frozen before being exported. The canning and freezing industry alone is worth $4 to $5 billion. It employs approximately 60,000 people each year paying out about $455 million annually in wages and benefits. The industry provides indirect employment for a large number of workers in related industries such as farm labor, suppliers of equipment and materials, transportation, brokers, wholesalers and retailers. In 1980, canners paid California farmers approximately $600 million for raw products. California provides the United States with

40 percent of its canned fruit and vegetables and 30 percent of its frozen fruits and vegetables. Ninety percent of the state's production is shipped out of state to other states or countries. This is equal to 270 million cases of canned goods and 900 thousand pounds of frozen fruits and vegetables annually.[121]

The large processors can dictate to farmers what and how much they plant since contracts are signed in advance. Tomato canneries determine exactly how much sauce, juice and paste they will produce based on carryover from the previous year. The canneries set the price they will pay and the amount they will purchase from growers. In a variety of crops, cooperative processors are being replaced by independents. Tenneco West, a large landholder and major supplier of almonds, now has its own processing operation which competes with the California Almond Growers Exchange.[122]

The California fruit processing industry has been slow to respond to changes in the market-place, and as a result, profits on canned fruit are low. In the last 10 years the number of freestone peach canners has dropped from eight to three. According to an industry spokesperson, every processing fruit in the state is having the same problem. "The day is rapidly approaching when consumers will not have a choice and will be lucky to even find a can of fruit on the supermarket shelf."[123]

The freezing and canning companies utilize fruits and vegetables grown mainly in California, but there is a sizable meat packing industry which is dependent upon imported livestock or on livestock fed and fattened with grain imported from mid-western states. The 127 meat packing/processing plants employ 5900 people and produce $1.5 billion worth of product. This is about 5 percent of the national total, and would be equivalent to about half the state's consumption.[124]

The major threat to the stability of California's food industry will come as food production and processing become more regionalized. As eastern and midwestern areas begin growing more competitive produce as suggested in the results of a recent California Department of Food and Agriculture study[125] due to higher transportation costs, food processing will also shift closer to the growing areas. The tomato processing industry may be especially vulnerable since California produced 89 percent of the country's processing tomatoes[126] -- a commodity easily grown in other areas of the United States.

FOOD AVAILABILITY

Statistically, California is the most urban of the fifty states; 94 percent of the population live in cities at considerable distance from the resources which sustain them.[127] Most of these people come in closest contact with their food as consumers in their grocery store and are unaware of the production, processing and distribution channels through which the food has traveled. Supermarkets are one of the last stopovers for food.

The market areas of Los Angeles, San Francisco and Sacramento, with a total population of 17.8 million have over 2,200 supermarkets (supermarkets are defined as having sales of over $2 million yearly), or 34.4 supermarkets per 100,000 households.[128] Considering these statistics it is surprising to learn that there is already a food crisis in California's inner cities.[129] The urban poor are forced to pay exorbitant prices for food that is of poorer quality than that found in other areas. It is estimated that residents of California's inner cities are paying 20 to 25 percent more for food. Thousands of people do not have even minimal access to adequate, competitively-priced food.[130] While the problems are much greater than a simple lack of grocery stores, it is clear that many inner city residents are at a disadvantage, both economically and nutritionally.

Many people just cannot afford food. Over 7 percent of California's population are receiving food stamps. In August 1982, this amounted to 1,683,983 people receiving stamps worth over $50 million.[131] More recent data indicated that this amount is up to $58.8 million monthly. California is second only to New York in monthly food stamp expenditures.[132]

More food could be available if waste and inefficiency were reduced. Considerable amounts of food produced by farmers are wasted or lost in the food system. And, it is not just food that is lost, but energy and resource inputs as well. For produce alone, 9 to 16 percent is lost in the transportation, wholesale and retail chain.[133] For California produce grown in 1980, this is equal to a loss of at least $479 million.[134] Incredible amounts of food are wasted in the home as well. It has been estimated that 15 percent of a city's edible food is thrown out (at an annual cost of $11 to $13 million for a city with a population of 330,000).[135] Another study estimated that 14 percent of the food purchased by the average 2-person household is not eaten but discarded.[136] With cutbacks in food assistance programs, a more concerted effort must be made to minimize food waste, to both keep costs down and make more food available for consumption.

FISHERIES/MARINE RESOURCES

Over 800 million pounds of fish and shellfish were landed in California in 1980, worth $323 million to fishermen. Tuna makes up the backbone of California's fishing industry, with landings of 382 million pounds valued at $218 million.[137] The tuna complex includes six major species, most being caught off Central and South America. Bottomfish, or groundfish caught within 200 miles of the coast also bring in large revenues to the state, in excess of $50 million in recent years.[138]

While these landings are significant they represent only 70 percent of California's fish consumption;[139] fish are imported both to feed the state's residents and to supply the state's fish canning and processing industry. Much of this processed fish is then in reality exported to other states and countries. Tuna is the big money maker for fish processors, and in 1979, over 133 million pounds of fresh frozen tuna were imported for processing from countries such as Japan, South Korea, the Philippines, New Zealand and others.[140] Recently there has been a glut of tuna on the market and canneries have not been accepting fresh tuna landed in California. While the canneries can switch to other fish in this situation, it is not as profitable, and many cannery employees are working reduced hours. Fishermen have had to explore other marketing channels such as selling whole frozen tuna to consumers from the docks. These conditions are stimulating exploration and expansion of direct marketing to the benefit of those who catch the fish as well as consumers. While landings of traditional fish species are at or near optimum sustainable yield, there is potential for increasing the catch of lesser known and under-utilized species, some of which are now mainly exported to other countries.[141]

Salmon landings in 1982 were 7.9 million pounds. Vessel value of these ocean-caught salmon was $19.5 million.[142] In the early 1900's, the peak years, annual catch from ocean and rivers was around 13 million pounds each year. This decreased to a low of 4 to 5 million pounds in the late 30's and early 40's. Annual landings now usually range from 5 to 7 million pounds. This decline in salmon production is due to several aspects of man's activities, from dams on major river systems to pollution, urbanization, logging and irrigation.[143]

The transfer of irrigation water through the Delta area is creating a "reverse flow" of water. Anadromous fish (salmon type) swim toward pumps and are sucked into the California Aqueduct. Both recreational and commercial fishermen have long opposed the water projects that pose such a threat to the fish populatons of the Delta and Bay. The Department of Fish and Game estimates declines of 65 percent in the adult salmon population and 70 percent in adult striped bass. Striped bass are being sucked downstream at the rate of 70 million per year.[144]

Most aquatic ecosystems in southern California are under stress from a 70 to 80 percent depletion of instream flow due to irrigation. At these levels, a suitable habitat for most aquatic life cannot be maintained. In addition, the pumping of groundwater is causing salt water intrusion into the freshwater reserves along the coast of California, disrupting fragile ecosystems.[145]

RECOMMENDATIONS: Setting Priorities

Developing a secure, regenerative, and affordable food supply is the major goal of The Cornucopia Project. To attain this goal will require a great deal of effort on many levels -- from consumer and farmer to industry and government. The Cornucopia Project has developed a set of recommendations for California that could help create a more vibrant state economy, a more secure and affordable supply of food, and an environment that is sustainable into the 21st century.

The major strategic themes running through all of the recommendations are outlined below. These four points are the most important and deserve the highest priority. They are followed by a series of more explicit recommendations aimed at the various participants in our food system. Any thoughtful response to food system problems has to be made on a variety of levels. Responses are needed from: the consumer, who is the foundation of the entire food system and who has the most power to change it; the farmer, who produces our food; the food industry, which processes and distributes our food, and which has the power to improve our food system in relatively short order; the cities, which will be hit the hardest by any food crisis; the state, which has the power to do many of the things necessary to make California's food supply secure; and the research community, which can improve the system we now have.

MAJOR STRATEGIC THEMES

I. California Should Maintain Its Physical and Human Resource Base

Land, water and farmers are the foundation of California's largest industry. It is imperative that measures be taken to ensure the preservation of agricultural land and water supplies, and to minimize soil erosion and environmental degradation. As water supplies are depleted and soil productivity and land availability decline, there is less and less potential for sustained food production for anyone. With the state's growing population, demand for food, resources and land will continually put added stress on the whole system.

Preservation of prime farmland is no longer a debatable issue. The state needs all the prime farmland it has. It can no longer afford uncontrolled, rampant development on the best lands.

Water use must be curtailed with conservation practices and greater efficiency. The installation of more efficient irrigation systems now will ensure that crops can be produced in the future. Efforts must be made to develop crops which can tolerate drier conditions.

Farmers are critical components of our food system. Efforts must continue to make their livelihood profitable, sustainable, and accessible. People who wish to farm must have the financial and technical support to do so. Farm support services must be maintained to provide essential materials and services to the farm community.

II. California Should Support and Encourage Small and Medium-Size Farms

The vitality and health of California's food system depends upon the many small and medium-size farms in the state. Keeping these farms operating and economically viable will guarantee stability by distributing money and decision-making among many people rather than among a few large corporations with interests other than sustainable food production. The maintenance of smaller enterprises also assures more flexibility and diversity in crop production leading to healthier agroecosystems.[146]

The means of supporting these farms and farmers are many and varied. One way is through promoting and encouraging local markets. This helps to assure the farmer of being able to sell a crop and provides benefits for both consumer and producer. The benefits of buying locally are numerous. They include lower transportation costs, less energy consumed in transportation, less waste due to long distance hauling, and potentially more nutritious produce since vitamin and mineral content decreases with time following harvest. Local farmers benefit as much as consumers because they have a market for their produce which will pay more than an interstate broker. U.S. Department of Agriculture studies of direct markets in Colorado showed that local farmers received 44 percent higher gross returns if they sold locally than if they marketed through wholesale channels. Consumers received an average 28 percent discount compared to supermarket prices.[147] A study in New York City showed price savings ranging from 7 to 35 percent.[148]

III. California Should Grow More Food for In-state Consumption

Since most of the food imported into California is meat -- pork, chicken, beef, veal and seafood -- the state could increase production of these animals to become more self-reliant. California may be forced to do this as cattle production begins moving eastward from the Plains to the Midwest. Rising irrigation and transportation costs are making it more practical to raise cattle in states such as Illinois where large amounts of grain are grown.[149] Producing all the meat and poultry consumed in state is not possible since that would require 11.27 million acres of California's agricultural land. Beef production alone would require over 9 million acres.[150] However, it is desirable and feasible to increase the state's current production to minimize long distance transport and provide a fresher, higher-quality product to consumers. New jobs would be created and the state's economy would be strengthened. If California could produce all the beef consumed in state, 124,400 jobs would be created. The production of 100 percent of the state's pork would provide over 154,600 additional jobs in production, processing plants, and distribution.[151]

Besides creating jobs, increased animal production would generate more fertilizer for crops. California's livestock and poultry produced 6.3 million tons (dry weight) of economically recoverable manure in 1979, containing over 125,000 tons of nitrogen, nearly 42,000 tons of phosphorus and 110,000 tons of potassium. This is impressive when you consider that farmers used 580,000, 84,000, and 56,000 tons of N, P and K respectively in the same year. If California produced all the beef, pork and chickens needed, there would be 37,137 additional tons of nitrogen available, 15,255 more tons of phosphorus and 25,000 tons of potassium. The total would be enough to supply 28 percent of the nitrogen, 68 percent of phosphorus and 240 percent of the potassium used in 1979.[152]

Increased use and better management of marginal lands could provide additional rangeland for grazing beef cattle. Presently 12 million of the 17.5 million acres of rangeland are in need of conservation treatment.[153] The meat from these animals would be less resource intensive (fewer fossil fuel inputs for grain production, less need for capital-intensive machinery and equipment) as well as being leaner than meat from grain-fed feedlot cattle. More use could be made of fruit and vegetable cannery wastes as feed for livestock and poultry.

IV. California Should Continue to Expand Consumer Education and Awareness

Informed consumers can actively participate in working towards sustainability and regeneration in the food system. Consumer demand can effectively influence the California food industry more than any regulatory or legislative action. Individuals can also have a tremendous impact on local grocery stores and their purchasing policies simply by asking for locally grown, locally-processed foods. Increased consumer awareness and action may be the single most effective force in changing the direction of California's food system.

The following set of recommendations offers more detailed analyses of what consumers, farmers, the state and local governments, the food industry, and our research community can do to regenerate California's food system.

RECOMMENDATIONS TO CONSUMERS

1. Become more active in your food system. Increase your awareness of what foods are locally produced and which are transported in from other areas of the country. Know the nutritional quality of the food you consume. Share information with friends, neighbors, and supermarket and grocery store personnel.

2. Form a local Cornucopia Project consisting of people who want to work at changing some aspect of their food system. Possible activities include establishing home and community gardens, bartering, cooperative food buying, storing and preserving, setting up food banks, and gleaning from harvested fields.[154]

3. Purchase locally-grown fruits and vegetables in season, taking advantage of their peak nutritional value and decreased cost. You can also process these foods and store them for the periods when they are unavailable to eliminate higher costs of commercially processed and packaged food.

4. Support your local farmers by purchasing food directly from growers, thereby increasing their needed financial support while enjoying fresh, nutritious foods at reasonable prices. Start food co-ops and for additional savings, contract with farmers in the region to produce some of your food.

5. Change your eating habits to improve and maintain your health by consuming less fat, salt, sugar, and cholesterol while increasing fiber and vegetable protein intake.

6. Start a home garden to produce more of your own fruits and vegetables. Community gardens provide a greater selection of produce when the harvest is shared with cooperating gardeners. They offer access to land for those (especially urban residents) who might otherwise be unable to garden.

7. Extend your growing season by building solar grow-frames and/or utilizing container gardening.

8. Organize a land trust which could purchase critical agricultural properties as they come on the market, resell them with deed restrictions to new farm owners, or transfer them to other appropriate trusts or to the city, county, or state at some future time. A land trust is a non-profit corporation which is able to own real property or interest in real property. It is one way to offer permanent protection to selective farming areas within local communities.

9. Conserve water by introducing drought-tolerant landscaping with native plants and by installing cisterns and flow-restriction devices.

RECOMMENDATIONS TO FARMERS

I. Farmland Preservation

1. Learn about the diversity of technical assistance and services available to farmers through local conservancies and land trusts, which can show the best options for the future use of land, including areas which are not essential to farm production. This kind of planning service would help farmers realize certain economic benefits while still maintaining and preserving their farm operation.

2. Reduce excessive pumping of groundwater which can deplete aquifers at a rate faster than they can be replenished. This is of particular concern in Southern California where increased population demands, industry, and agriculture compete for fragile water supplies. Reducing overpumping will also curtail subsidence and salt water intrusion.

3. Consider crops which need less water and use mulches and groundcovers.

4. Plan for necessary drainage to avoid salt build-up in soils.

5. Preserve farmland by decreasing soil erosion. Your local soil conservation district will provide you with assistance in developing or updating a soil and water conservation management program, suggesting strategies to build the soil and reduce the need for increasingly costly fertilizer inputs.

6. Reduce soil losses through combinations of structural and management practices, such as conservation tillage, cropland terraces and diversions, contour farming, the use of crop residues, winter cover crops, and hedges.

7. Take land that is severely eroding out of production.

8. Use marginal lands for grazing livestock instead of crop production.

9. Have soils tested accurately to determine the nutrient value of the soil and its fertilizer needs in order to prevent overuse of costly, energy-intensive fertilizers. Beware of inaccurate soil testing services.

II. Farm Inputs/Resources

1. Diversify production with selected combinations or rotations of

crops or an interplay of crops with livestock. This practice would reduce fertilizer and weed control costs while providing the farmer with greater market stability.

2. Diversify production regarding not only types of crops but individual strains of a single crop so as to reduce the risk of farm pests blighting the entire crop.

3. Reduce energy use by investing in more fuel-efficient machinery, looking into solar dryers, letting crops dry naturally whenever possible, adding insulation where feasible, and taking advantage of natural lighting in farm buildings. Investigate possibilities for using alternative energy sources, whether this be the conversion of manure into methane or the use of solar heat for crop drying and other on-farm energy requirements.

4. Utilize mulching and more efficient water use in establishing young orchards. This can cut water use for that purpose by 20 percent.[155]

5. Plant crops that don't need as much water.

6. Install more efficient irrigation systems such as trickle irrigation and linear-move systems. Utilize computer scheduling where available. Time the use of sprinkler systems carefully so that evaporation is minimized.

7. When dealing with different soil types in large fields, consider reducing field size for maximum ecosystem diversity. This would establish a healthier ecosystem which can vary greatly in one large field.[156]

8. Consider using management practices that will reduce the need for chemical fertilizers, pesticides, and other expensive inputs.

9. Develop on-farm fertilizer sources by growing nitrogen-fixing legumes and green manure crops.

10. Utilize marginal land in combination with more productive soils and proper management to maintain more cattle, thereby increasing beef and organic fertilizer production.

11. Avoid routine spray schedules. Apply pesticides only when needed and target spraying to delay the onset of insect resistance, reduce undesirable residues, do minimal damage to beneficial insects, and decrease costs.

12. Consider alternatives to pesticide use and/or reduction. These could be: integrated pest management involving monitoring pest

levels for proper timing of applications, no-tillage, crop rotations and interplanting, narrow rows or broadcast seeding to establish a canopy sooner than with wide row spacing, and biological control of pests to maintain the natural ecosystem.

III. Marketing/Economics

1. Organize marketing co-ops to provide restaurants, schools, and other institutions with locally-grown produce.
2. Work cooperatively with the consumer by selling directly to the public. This will ensure a higher price for the farmer's goods and fresher produce for the consumer at a lower cost.
3. Locate marketing centers strategically for the assembly, grading, packing, and distribution of the output from many small producers thereby providing large buyers with the volumes and specifications they require.
4. Consider small-scale processing on the farm such as processing sausage, cured meats, pickles, preserves, cheeses, etc. Fresh produce can be washed, sorted and packaged for sale to restaurants and markets. Dried beans, nuts, and seeds as well as honey can be sold to food stores and restaurants.
5. Investigate before planting what specific varieties of crops purchasers wish to buy by surveying bulk food purchasers in your area.
6. Sharpen marketing skills by examining price movements to forecast supply and demand. De-emphasize concentration on farm production while allowing time to think, plan, read and analyze the current market so as to obtain a better price for agricultural products.
7. Extend the availability of some produce by staggering planting and harvesting dates and by selecting varieties with varying periods of maturation.
8. Begin to work towards changing grading and marketing standards that reflect the nutritious quality of the crop rather than its uniformity and appearance.
9. Seek to reduce debt to manageable levels.
10. Encourage local newspapers, if a section is not already provided, to devote columns to farm problems and a listing of local/seasonal food availability.

RECOMMENDATIONS TO LOCAL GOVERNMENT

1. Aid and encourage local food production and distribution by instituting a department to regulate and protect agricultural land use, encourage urban and rural food production, develop urban markets for local produce, initiate educational programs, and create plans to meet normal and emergency local food needs through local production and storage.

2. Identify the long and short-term costs to a city or county before converting any prime farmland to development use.

3. Encourage building at higher densities, and filling-in of suitable sites in existing urban areas.

4. Develop and encourage local food production by:

   a. Establishing city-run gardens in low income areas, and/or providing seeds, tools, and technical assistance on gardening to those receiving food stamps and other kinds of food assistance.

   b. Providing funds to establish gardens and/or greenhouses and subsidizing gardens in schools, prisons, hospitals, and nursing homes.

   c. Establishing community farms on urban fringes to be worked by local farmers or interested city residents.

   d. Promoting contract growing whereby groups of urban families, co-ops, or the city itself arrange to purchase food directly from a local supplier.

   e. Developing loan funds for food self-reliance projects, such as greenhouses, food preservation and storage operations, and small businesses associated with urban agriculture.

   f. Establishing urban agricultural testing programs with the state Cooperative Extension Service to test crop varieties, analyze soil for nutrients and pollutants, test crops for pollutant residues, prepare demonstration sites for various types of urban agriculture and waste recycling, and offer technical assistance on farming as well as design and construction of community greenhouses, cold frames, rooftop gardens, etc.

   g. Encouraging local industries which produce low grade waste heat to make use of this energy by producing food in attached greenhouses.

    h. Utilizing waste water and treated sewage where possible.

    i. Requiring garden areas in new multiple unit housing projects.

    j. Making certain that urban street tree programs preserve solar access for food production.

5. Develop and encourage local markets by:

    a. Establishing farmers' markets in the city, particularly in low-income neighborhoods, and facilitating authorizations for farmers to accept food stamps at the markets.

    b. Creating mobile farmers' markets and/or fish markets to visit housing projects, neighborhood centers, factories, and universities.

    c. Assisting in the formation of food cooperatives, co-op stores and preservation/storage centers.

6. Develop and encourage local food processing and storage by sponsoring community food preserving facilities where residents use this service free or at a low cost and/or providing incentives to grocery stores to establish food preserving facilities for their shoppers.

7. Facilitate access to food by implementing a "food hotline" to provide referrals for emergency food, food stamps, and meals for elderly.

8. Create a greater understanding of the importance of agriculture to urban areas through educational programs. Offer seminars in urban agriculture, aquaculture, container and rooftop gardening, food preservation, storage preparation, and nutrition.

9. Establish food banks in your area to store and distribute surplus food.

10. Have county institutions purchase their food supplies from local farmers.

11. Preserve the remaining farmland in the vicinity by creating agricultural open-space preserves to retain prime farmland for agricultural use.

12. Set aside areas for recycling facilities.

13. Consider applying part of the monies from the real estate transfer tax to a local purchase of development rights program

14. Investigate land use techniques like clustering, performance controls, and transfer of development rights which would give farmers greater options to develop either on the farm or in other areas within the community or region.

15. Establish an Agricultural Development Council similar to the one in Chester County, Pennsylvania. This council would focus on generating economic solutions to the problems of farmland loss in the counties. These local agricultural development councils would be comprised of people from the entire food system in the county and include farmers, processors, distributors, store managers, and farm service equipment dealers, as well as realtors and bankers. The council could develop local markets for local producers. It could survey local producers to see which ones would grow produce for local consumption and survey local stores, restaurants, and institutions to encourage them to purchase more locally grown foodstuffs. The council could also determine where local food is coming from and could promote more consumption of local foodstuffs. As suggested by Chester County, the council could become involved in "farm brokeraging" which would match new farmers with those who want to sell.

16. Develop and enforce county and city zoning ordinances to control land-use and management for proper reduction of sediment yield. This would include the need for local governments to create primary and secondary flood plain districts to provide land-use regulations to properties situated in floodways and to provide for flood plain zoning where necessary.

17. Minimize stream siltation and watershed erosion damage by more strictly enforcing local excavation, grading and road-building ordinances, as well as local subdivision and lot split ordinances.

18. Strictly enforce county regulations governing the use of insecticides and herbicides and the discarding of containers.[157]

RECOMMENDATIONS TO THE STATE

1. Promote agricultural production within California and nearby states by:

   a. Offering incentives for farmers to diversify production, utilizing technical assistance from extension agents and low-interest state-guaranteed loans to make changes necessary for diversification.

   b. Discouraging any concentration of economic control over agricultural resources and markets that diminishes the competitive position of the family farmer and impedes the entry of new farmers. Federal tax law is a powerful factor encouraging such concentration, but it is beyond the reach of the State. However, some major agricultural states have enacted laws seeking to reduce these negative effects through limiting ownership or investment in agriculture by certain entities such as foreign investors, investor syndicates, or conglomerates not having agriculture as their principal business. Other states are considering such laws. California should investigate this approach for its own posssible use.[158]

   c. Establishing demonstration experiments to test crop, animal, and fish varieties suitable to California soil and climate as well as developing low-input sustainable farming techniques.

   d. Providing tax incentives for small-scale food producers, such as not taxing the first $10,000 of income from food produced for local consumption.

   e. Issuing state tax credits for home and farm production, processing, and storing of food.

   f. Encouraging new farmers through loans and incentives to enter into certain types of farming operations, those which would maintain the optimal balance of farm types in the state. (See Research Recommendations #1).

   g. Initiating a program like New England's Small Farm Management Assistance Program to provide practical farm management skills to small-scale commercial farmers on a one-to-one basis.[159]

   h. Organizing a farmer linkage program whereby experienced farmers bring prospective farmers into their operation easing the transfer of land ownership over time. In this way the new farmer would be more successful in avoiding costly farming mistakes while gaining the tenured operator's knowledge of the farm.

i. Establishing a statewide Agricultural Development Council which would seek to enhance the viability of farming throughout California in the same way that industrial development agencies seek to encourage industry to locate in-state. This kind of council would consist of representatives from all parts of the food industry.

2. Preserve remaining farmland in the state by:

   a. Publishing guidelines to help local governments protect agricultural land and enhance farming. These guidelines could include ways to prevent "leapfrog" or random development, which removes from production not only the land that has been developed, but which in the long run isolates adjacent farming areas and inhibits certain farming activities. The state could also delineate ways whereby municipalities could best protect farmland in urban fringe areas, and it could prepare guidelines for different kinds of farmland preservation strategies and techniques including agricultural zoning, agricultural districts, transfer of development rights, community land trusts, performance zoning, and so forth. It could prepare procedures which would help local governments assess the different kinds of strategies that would be most appropriate and feasible for them, given the extent of farming in the area, development pressures, commitment of farming community to remain in agriculture, existing and potential land use, economic characteristics, natural features, and attitudes of local residents towards preserving farmland.

   b. Using economic incentives to promote construction of affordable housing, small-scale commercial districts and clean industry within existing urban areas; use disincentives to discourage the sprawl of low-density development across agricultural land.

   c. Instituting a farmland capital gains tax in ways which would discourage speculators from investing in farmland, and selling it for development.

   d. Reducing the capital gains tax for those farmers who sell farmland to young, beginning farmers, especially if farmland is sold at less than full market value.

   e. Creating a committee to inventory and monitor all state-owned farmland and assess its productive capability while working to ensure that this land remains in farming.

f. Adopting a "right of first refusal" or preemption option which is currently used in France, where owners of farmland within designated areas must by law notify a state-chartered nonprofit corporation of their intention to sell their land. The corporation has the right to buy the farmland within 30 days.

g. Identify and protect unique and endangered areas, whether publicly or privately owned. The goal is to preserve genetic diversity, biological productivity, and ecological integrity as well as safeguard recreational, historic, cultural and agricultural values.[161]

h. Encouraging legislation which would record agricultural land transfers on an annual basis.

i. Keeping a yearly record of how effective current farmland preservation legislation has been.

3. Preserve water, soil and other natural resources by:

a. Linking economic programs, such as loans, crop insurance, disaster relief, and state purchase of farm commodities, to the avoidance of excessive soil erosion and use of efficient irrigation techniques.

b. Instituting and enforcing a "severance tax" on soil losses due to excessive erosion to finance subsidies, to encourage conservation practices, and to pay for downstream dredging of silt, damage to water treatment facilities, and other social costs.

c. Establishing rewards for soil enrichment, such as tax credits for on-farm soil and water conservation programs, including contour tillage, minimum tillage, and crop rotation. Using public subsidies, such as low-interest loans, preferential farm property tax formulas and valuations, and other tax incentives to encourage cover and permanent cropping, minimum tillage, ridge planting, proper rotation, longer rotations, biological nitrogen fixation, contour plowing, terracing, stripcropping, leaving harvest residues on soil surfaces, reducing soil compaction and salinity, intercropping, and regional organic waste recycling.

d. Developing incentives for encouraging the use of rental arrangements which include provisions for sharing erosion control and soil enrichment costs with the landowner.

e. Developing public awareness programs to promote understanding of the need to support sound soil conservation practices.

f. Paying more attention to economic efficiency criteria in developing and allocating water and stop using water policy to redistribute income.[162]

g. Pricing new water at the relevant marginal cost and reforming water institutions to permit them to use this rule.[163]

h. Creating firm property rights in water similar to those in land and allowing a water market to allocate it among uses and users.[164]

i. Using depletion and effluent taxes as corrective devices when external effects are significant, such as in pumping groundwater from common pool aquifers and in the most severe water quality cases.[165]

4. Expand local markets by:

   a. Establishing more farmers' markets and organizing wholesale farmers' markets to supply retailers, consumer co-ops, and other volume purchasers.

   b. Increasing promotional efforts for direct purchase of food from farmers by supermarkets, restaurants, schools, hospitals, and other institutions.

   c. Continuing to develop linkages between large-volume food buyers and California producers.

   d. Giving preference to in-state producers in bidding for the sale of foods by permitting state institutions to purchase foodstuffs directly from local farmers and in-state producers at prices at or in excess of the lowest submitted bid according to a percentage to be determined by the state. An example of this kind of policy is the state of Maine's 1979 law relating to state agency purchase of Maine's farm and fisheries products. Massachusetts is also considering such a law.

   e. Assessing the viability of implementing in California marketing alternatives to determine price and maintain market access for individual farmers through electronic commodity markets, vertical coordination through forward contracting, forward deliverable contract markets, and mandatory public reporting of market information. Other options include exclusive agency bargaining, vertical integration through ownership, joint ventures between agricultural cooperatives and agribusiness-marketing firms, marketing orders, and marketing boards.[166]

f. Establishing regional livestock marketing committees to evaluate alternatives such as regional market centers owned and operated by either a local or a regional cooperative, a regional electronic sales exchange, and contract sales to packers, while providing for more direct movement from producer to slaughterer thereby decreasing costs.[167]

g. Providing incentives for existing food companies to develop more energy-efficient processing and packaging techniques, along with incentives to attract new food processors.

h. Helping to establish community food processing and storage facilities for the use of families and small commercial food producers. In this way, economies in equipment and energy consumption can be realized.

5. Effect a transition from depletable to renewable energy sources by conducting regional inventories of all renewable energy sources and providing incentives, such as tax credits or low-interest loans for investments made in agricultural energy conservation and on-site development of renewable energy sources, or tax exemptions for income received from the production of renewable energy.

6. Recycle organic wastes to utilize their full potential by:

   a. Preparing a state-wide inventory of the types and amounts of organic wastes available now and in the future and assess the ability of these wastes to improve soil fertility and tilth and their potential energy use.

   b. Developing incentives for using local organic wastes for fertilizer and incentives to industry to separate toxic substances from their wastes so that they might be more safely used on cropland.

7. Enact a bill which requires returnable bottles and the recycling of metal cans. This would reduce materials consumption in the food system.

8. Develop long-range food system plans by:

   a. Instituting a transportation policy - in conjunction with private industry and agriculture - which governs the shipment of agricultural commodities.[168]

   b. Creating an overall state food policy which will increase regional self-reliance and economic viability.

   c. Conducting an annual study of the condition of the state food system to find out the amount of food currently being imported and exported, soil erosion losses, amount of land lost to development, and other food system issues while stating what California can do to increase its self-reliance.

9. Instill a greater understanding of agriculture's role in all California citizens by:

   a. Increasing awareness of seasonal, locally-grown produce, and its nutritional and economic benefits.

   b. Initiating educational programs on farmland preservation, water conservation, farm energy conservation, reduced pesticide and fertilizer use, recycling of organic wastes, and energy expenditures in different methods of farming and home food production and preparation.

   c. Promoting nutrition education campaigns illustrating the relationships between diet and health and the benefits of fresh, locally-grown, and minimally processed foods, as well as bulk purchasing of food.

   d. Communicating goals and the condition of our food supply as revealed in the state's annual study.

10. Agricultural programs initiated or funded by the state should give high priority to serving the needs of the family farmer.[169]

11. Strengthen and expand tax policies and building codes that reward energy-efficient building, manufacturing, agricultural practices and waste disposal.[170]

12. Preserve fisheries resources by:

    a. Designating and enforcing fishing regulations to maintain the optimum sustainable yield while protecting the natural marine ecosystem.

    b. Encouraging improved fishing practices and equipment to achieve the optimum sustainable yield while protecting the natural marine ecosystem.

    c. Requiring water projects to provide funds for determining project effects on the fisheries and for making such adjustments as may be necessary. This must include adequate pre-project and post-project studies.[171]

d. Providing that water development agencies have a continuing responsibility for the maintenance and enhancement of fish and wildlife for the life of the project.[172]

RECOMMENDATIONS TO THE FOOD INDUSTRY

1. Encourage sustainable farming methods by using the food industry's influence on farm production techniques to decrease the use of large amounts of irrigation water and dangerous pesticides and increase the use of soil conservation measures. De-emphasize produce appearance while concentrating on freshness and nutritional quality.

2. Minimize energy and material use by using less processing (and/or more efficient methods), simpler packaging, and rail networks more often in transporting commodities.

3. Promote the consumption of fresh, locally-produced food in season, enhancing consumer nutrition and building a stronger local economy.

4. Provide nutrition education, hints for food preparation, and techniques on preserving fruits and vegetables.

5. Focus on food in a holistic way, recognizing that diet is an essential component of a healthy life and is influential in preventing as well as treating illness.

6. Grocery stores should purchase and label for consumers California products. Point-of-purchase literature could be made available to consumers to make them aware of where food orginates and the issues involved with this.

RECOMMENDATIONS TO THE AGRICULTURAL RESEARCH COMMUNITY[173]

1. Determine the optimal mix of farm types in California to obtain sustainable yields of both crops and livestock to meet the state's consumption needs and to provide a sufficient level of exports. Determine the production needed to support processing plants for various commodities. If the commodity is produced in quantities sufficient to make a processing plant economically competitive, this would be an incentive for establishing those businesses in state.

2. Assess relationships between biofuels development (including forest resources) and long term soil productivity to provide guidelines for future programs.

3. Investigate how to improve the capability of using forage and crop wastes, as well as wastes from food processing.

4. Improve forage and grain species through plant breeding.

5. Integrate new crop cultivars into feed production strategies that optimize and preserve natural resources yet maximize efficiency of energy use.

6. Continue and expand small-scale agriculture research at the University of California. This will not only aid small-scale enterprises, but will also help large-scale farms diversify.

    a. There is a need for smaller equipment which would use less energy and decrease the amount of soil compaction and erosion, at a cost that small operators can afford.

    b. Continue and expand research on fruits and vegetables and post-harvest handling methods to benefit small-scale producers.

    c. Continue livestock management and forage research programs aimed at smaller enterprises.

    d. Continue to develop beef feeding systems based on forages rather than high-energy grains.

7. Work to develop plants which resist pests and mature earlier so less drying is required.

8. Develop crop varieties adaptable to low-input farming systems in California.

9. Continue and expand research on dryland agriculture.

10. Conduct studies to determine the salt loading that occurs under various water application technologies. Farmers could then be taxed in such a way that the external cost of soil salinization could be internalized, thus providing an incentive for farmers to reduce the damage.[174]

11. Investigate California's soil erosion problems, looking at crop residues, run-off, tillage practices, rotation systems, terraces, equipment use, etc.

12. Investigate perennial agricultural systems (permaculture) appropriate to California to eliminate annual soil disturbance and decrease energy, fertilizer, pesticide and herbicide usage.

13. Determine the long-term effects of recommended applications of chemical fertilizers, pesticides, and herbicides on the productivity of selected California soils.

14. Update the Stanford Research Institute's inventory of organic wastes which are available to improve soil fertility and tilth.

15. Investigate methods to utilize California municipal wastes in agriculture.

16. Expand research on biological nitrogen fixation.

17. Increase exploitation of legumes that fix their own nitrogen and that have higher feed intake potential and overall forage quality than do grasses.

18. Improve crop management, harvesting and storage methods to minimize losses of plant material.

19. Explore alternative feed sources -- by-products and wastes from agriculture, domestic and industry sources -- in the interests of conservation of resources and economy. Also look into the use of aquatic plants and animals as feeds.

20. Set up plots to study the transition phase of switching from conventional to low-input farming systems.

21. Examine the response of different sizes and types of farming units to changing energy and resource scenarios.

22. Continue research on the impact farm scale has on rural communities.

23. Examine methods for producing food in cities, e.g.,rooftop food production systems. Seek ways to make urban food distribution and marketing systems more accessible to local and regional food producers.

24. Develop more energy-efficient food processing, storing, and distribution techniques.

25. Explore feasibility of switching to more energy-efficient transportation modes.

26. Explore the potential of small-scale aquaculture in California to provide high-quality protein using cost-efficient and ecologically sound methods.

27. Expand and intensify studies of relationships between fish resources and their habitats and between stream turbidity and sport fishing success.

28. Conduct studies to develop new and efficient stream rehabilitation practices.

29. Establish an adequate flow and sediment monitoring network on North Coast streams.

30. Develop alternate logging methods to reduce erosion and stream siltation. 175

31. Develop scientific information on the stocks and life histories of commercially, recreationally, and ecologically important species of fish, shellfish, marine mammals and other marine fauna.

32. Develop scientific understanding of the effects of man's activities, including navigation, agriculture, mineral extraction, recreation, and waste discharge, on the marine ecosystem.

SUMMARY OF RECOMMENDATIONS

The preceding lists of recommendations are not easy reading. Some of the recommendations may seem hard to implement. Regeneration is never an easy process. But consider how much harder it will be to pick up the pieces should California's food system collapse.

Our recommendations should be viewed as a flexible agenda rather than a rigid program. They are based on what we know today. Tomorrow, as we learn more, we can revise our assessments of the problems and our options. We hope that part of our learning process will come from you in the form of feedback on what you've read in this report.

It is vital that we all realize we have the option to change our food system, and that we can exercise that option now. The time to begin planning for regeneration is today.

WHAT HAS BEEN DONE

There are many agencies and organizations in California which are already working to create a sustainable and stable food system. In every area of concern - from water and land issues, to marketing and nutritional issues, to general structural analysis - people in California have been developing and refining understandings of and information about the state's agricultural industry. This has resulted in many positive actions carried our by both the state and private sector. Although there is much work to be done, first steps have been taken. We acknowledge and congratulate the research and development efforts directed towards the creation of a sustainable food system. The following listing highlights some of the efforts being made at a variety of levels.

* In April 1976, a Direct Marketing Program was established with the California Department of Food and Agriculture. A number of programs and trial projects were established as a result: a direct marketing hotline and newsletter, facilitation of institutional purchases of food directly from growers, certification program, annual Direct Marketing Conference, etc.[176]

* California has a statewide Direct Marketing Association to serve the interests of direct marketing and related alternative marketing strategies.[177]

* The California Department of Conservation is engaged in a Farmland Mapping and Monitoring Program which will 1) establish an inventory and data base of commercial farmlands and grazing lands in California, and 2) document, map, and report farmland conversion each year. Computers will permit rapid update and revision of farmland maps.[178]

* Many county governments, where the greatest authority to protect agricultural land lies, have instituted large-lot zoning. The minimum size may be as low as two or as high as 320 acres, so as to make the land unattractive for anything other than agriculture.[179]

* People for Open Space, a regional planning group in San Francisco is active in farmland preservation and recently completed a study on San Franciso Bay area farmland entitled, Endangered Harvest which has made

farmland preservation a larger issue in the area.[180]

* A bill calling for a state-wide Agricultural Land Trust is to be reintroduced in the 1983 California legislative session.[181]

* The University of California appointed a special task force in 1976 to bring to light the public policy issues and information needs of the 1980's. The result was the publication of Agricultural Policy Challenges for California in the 1980's, a 137-plus page document.[182]

* The University of California Cooperative Extension has a strong small farms program dedicated to farmers and other participants in "limited-scale agriculture" in California. [183]

* The California Institute for Rural Studies, funded by private donations and public grants, has a library devoted to agricultural issues and conducts research not being done by the university and other institutions. The Institute prepares books and papers, and gives seminars on agricutural topics.[184]

* The California Department of Consumer Affairs collects data on the consumers' cooperative movement through its Cooperative Development Programs. It issues a Food Co-op Directory annually and numerous other publications on cooperatives and direct marketing.

* The California Legislature has revised the Agricultural Code to encourage aquaculture, the cultivation of fish, plants and crustaceans in fresh and saltwater. Aquaculture officially became part of the state's agriculture industry in August 1982, making its farmers eligibe for state subsidies and other forms of aid.[185]

* The California Occupational Safety and Health Administration recently imposed very strict exposure standards for the fumigant ethylene dibromide (EDB), used to fumigate fresh fruits and vegetables. California's standard on exposure to EDB is far stricter than the current federal standard.[186]

* California has instituted a tax on beef shipped in from out-of-state. (At this writing, hearings were being conducted in a suit filed against the tax by the American Meat Institute, the National Meat Association, and 11 packing companies.)[187]

* The California League of Food Processors has joined forces with the State and energy utilities to research and develop cogeneration alternatives to oil and natural gas. The Sun Diamond Growers, Inc. is turning walnut shells into gas; Lindsay Olive Growers use olive pits for fuel; and the California Almond Growers Exchange generates electricity and steam from almond shells.[188]

* The California Department of Food and Agriculture has strict regulations governing pesticides. The Division of Pest Management, consisting of four units, regulates the registration, sale, and use of pesticides.

The Pesticide Registration and Agriculture Productivity unit requires registration of all insecticides, fungicides, disinfectants, rodenticides, herbicides and other materials used around homes, industry, or farms for control of pests before being offered for sale in California. The application of any restricted material requires a permit, and quantities of all non-restricted materials applied by licensed pest control operators are reported. Quarterly and annual pesticide use reports are issued by the Department of Food and Agriculture. Data includes the chemical, the commodity upon which it was used, and the number of applications, pounds and acres.

The Pesticide Enforcement unit works with county agricultural commissioners to develop and enforce regulations governing pesticide use, storage, and disposal, and aid in investigative techniques, and worker health and safety procedures.

The Worker Health and Safety unit works to protect farm workers who mix, load, apply, store or otherwise handle pesticides or who work in treated areas.

The Environmental Monitoring and Pest Management Unit assembles information and data on integrated pest management, biological control, fate and behavior of pesticides in the environment, air pollution effects, and effects of these interactions on agricultural production and the environment.[189]

* The California State Legislature has awarded a major grant to the California Institute of Public Affairs to fund the California Farmlands Project, an investigation of farmland preservation in the state by a 38-member task force.[190]

* The California Farm Bureau Federation held a special conference for its leaders on farmlands conservation in October 1982.[191]

* The League of Women Voters of California has adopted agricultural lands as a priority issue for study and action.[192]

* The Sierra Club has reactivated its California agricultural lands committee.[193]

* The State Coastal Conservancy has incorporated farmland preservation into several of its projects in the coastal zone, which has an estimated 3.5 million acres of land devoted to grazing, dairy production, and fruits and vegetables.[194]

* County and city efforts to coordinate land use and development are facilitated by Local Agency Formation Commissions (LAFCOs) which exist in all counties of the state except San Francisco. LAFCOs mediate boundary disputes among cities and between cities and counties and identify the ultimate physical boundary and service area of each local government entity.

However, the LAFCOs have little real political power and have been effective in only a few instances.[195]

* The California Land Conservation Act of 1965 (Williamson Act) gives property tax benefits to farmland owners who agree not to convert their land to nonagricultural uses. However, this program is voluntary and has not been very effective in curbing agricultural land conversion especially without stringent agricultural zoning. The value of the Act diminished greatly with the passage of Proposition 13, the Jarvis-Gann tax reduction initiative of 1978.[196]

* Cities and counties are required by state law to develop general plans to rationalize and regulate growth, in part to protect open space and agricultural land.[197]

* Under the Williamson Act, legislation was passed in 1980 which permits landowners to have their land taxed either on the capitalization of income method or comparable sales and pay the lesser amount with county agreement. (AB 581)[198]

* Legislation exists which prohibits non-resident aliens or alien business entities from purchasing, holding or acquiring an interest in agricultural land. (AB 262)[199]

* Surviving spouses have total exemption from inheritance taxes. Provisions allow up to $500,000 tax exclusion on farm property passed to or inherited by a member of the decedent's family, and provides for the imposition of an additional tax, if within 15 years after the decedent's death, the heir to such property disposes of any interest in or ceases to use the land for farming. (AB 2092)[200]

* Fifty percent of all food sold in school snack bars and vending machines must be nutritious food, comprised of milk and dairy products, fruit and vegetable juices. (AB 3406)[201]

* Any entity or organization that sells food on school premises must select at least 50 percent of the food items to be sold from a list of nutritious foods. (AB 753)[202]

* Personal and corporate income tax deductions are allowed for taxpayers who make donations of food to non-profit charitable organizations. (SB 26)[203]

* The Organic Foods Act of 1979 provides standards relating to the production, advertising and labelling of food products as being "organic", "organically grown", "naturally grown", "wild", "ecologically grown", or "biologically grown". (AB 443)[204]

* Legislation was passed to create a financial incentives program for the purpose of stimulating the development and commercialization of renewable resource energy technologies in agriculture. This program will also assess the potential for solar energy projects in agriculture. (AB 3048)[205]

* The Department of Food & Agriculture currently administers a program which offers financial assistance, in the form of low-interest loans to farmers for on-farm production of alcohol fuels.[206]

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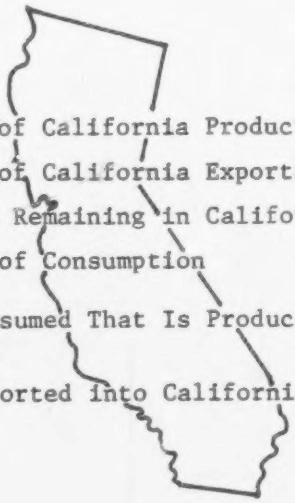
APPENDIX

INTRODUCTION TO FOOD IMPORTS CHART

California is the "Number 1" agricultural state in the United States. Approximately 10 percent of what goes into every shopping basket in the country comes from California. The state supplies 45 percent of the country's fresh vegetables and 53 percent of the processed vegetables. Fruits and nuts account for 50 percent of the nation's total. California agriculture is the most diversified in the world, and leads the nation in 49 commercial crop and livestock commodities.

Despite this, 41 percent of the food consumed by California residents is imported from other states and countries. Seven billion dollars actually leave the state each year to pay for these foods.

Much work needs to be done to ensure continued agricultural success. The huge amounts of food produced in California put a great deal of stress on the environment and natural resources. Maintaining the resource base should be given top priority. Increasing food production for in-state consumption should focus on meats, utilizing grazing lands for beef and by-products of the food industry for feedstuffs. Encouraging small and medium size farming units will also create a more flexible, diverse, and sustainable food system for California.



Total Retail Value of California Production	31,766,054.25
Total Retail Value of California Exports	19,201,148.49
Value of Production Remaining in California	12,564,905.76
Total Retail Value of Consumption	21,417,258.06
Portion of Food Consumed That Is Produced in California	59%
Percent of Food Imported into California	41%

CALIFORNIA FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight[a] (1,000 lbs.)	Retail Value (1,000 lbs.) (1979 dollars)	CONSUMPTION Retail Weight[b] (1,000 lbs.)	Retail Value ($1,000) (1979 dollars)	IMPORTS % Import	Retail Value of Import ($1,000)	EXPORTS % Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of CA Consumption
MEATS									
Beef	1,200,158.63	2,400,317.26	2,532,236.9	5,064,473.8	52.6	2,664,419.67			9,116,053[c]
Veal	15,010.46	105,073.23	47,067.6	329,473.2	68.1	224,399.98			d
Lamb & Mutton	38,346.9	87,430.93	35,300.7	80,485.60			7.9	6,945.34	11,767
Pork	51,033.45	102,066.9	1,652,072.1	3,304,144.2	96.9	3,202,077.3			1,502,397
POULTRY									640,760
Chicken	435,916.8	287,705.09	1,211,990.7	799,913.86	64.0	512,208.77			
Turkey	301,680	262,461.6	237,691.38	206,791.5			21.1	55,670.1	
Eggs	1,137,530.6	568,765.3	872,580.99	436,290.50			23.29	132,474.81	358,914
FISH[e]	263,652.4	790,957.2	375,364.11	1,126,092.33	30.0	335,135.13			
SHELLFISH	27,268.4	81,805.2	38,830.77	116,492.31	30.0	34,687.11			
DAIRY PRODUCTS									930,000
Fluid Market Milk	5,295,460.8	1,006,137.55	5,295,367.60	1,006,119.84					
Fluid Market Cream	249,773.0	52,452.33	74,752.72	10,448			70.0	42,004.33	
Cheese	1,148,955.98	1,585,559.26	566,223,23	781,388.06			50.7	804,171.20	
Condensed & Dry Milk	262,261.69	401,260.39	185,917.02	284,453.04			29.11	116,807.35	
Frozen Dairy Products	1,511,126.89	831,119.79	520,332.32	286,182.78			65.6	544,937.02	
Buttermilk	102,068.92	36,744.81	47,067.6	16,944.34			53.9	19,801.78	
Other Manufactured Products	814,490	NA[f]	407,245	NA			50.0	NA	
Butter	159,773.19	242,855.25	105,902.1	160,971.19			33.7	81,884.06	

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CALIFORNIA FOOD IMPORTS

	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
COMMODITY	Retail Weight (1,000 lbs.)	Retail Value (1,000 lbs.) (1979 dollars)	Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1979 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of CA Consumption
FATS & OILS									
Lard	4,141.1	1,863.5	54,127.74	24,357.48					
Margarine	NC[g]		270,638.7	178,621.54					
Shortening	NC		444,788.82	284,664.84					
Oils	NC		550,690.92	737,925.83					
VEGETABLES, FRESH									
Artichokes	81,282	20,320.5	9,413.52	2,353.38			88.0	17,967.12	1,123
Asparagus	43,680	51,979.2	7,060.14	8,401.57			83.8	43,577.63	
Avacados	231,240	173,430.0	28,240.56	21,180.42			87.8	152,249.58	4,861
Beans, Green Lima	90,896	NA							
Beans, Snap	28,012	19,608.4	32,947.32	23,063.12	15.0	3,454.72			4,234
Broccoli	313,408.8	162,972.58	32,947.32	17,132.61			89.5	145,839.97	4,341
Brussel Sprouts	70,840	21,252.0	NC						
Cabbage	182,466	49,265.82	204,744.06	55,280.90	10.9	6,015.08			9,313
Carrots	716,493.95	179,123.49	143,556	35,889.05			79.96	143,234.49	5,308
Cauliflower	199,043.24	153,263.30	30,593.94	23,557.33			84.6	129,705.96	3,401
Celery	1,046,250	387,112.5	176,501.25	65,304.46			83.1	321,808.04	3,593
Corn, Sweet	113,528	39,734.8	174,150.12	60,952.54	34.8	21,217.74			19,942
Cucumbers	81,880	32,752.0	101,195.34	40,478.14	19.1	7,726.14			4,078
Garlic	149,526	297,556.74	25,887.18	51,515.49			82.7	246,041.25	2,458
Lettuce	4,052,382	1,175,190.78	628,352,46	182,222.21			84.5	992,968.57	24,422
Winter	894,400								
Spring	1,403,000								
Summer	1,220,000								
Fall	840,000								

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CALIFORNIA FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight (1,000 lbs.)	Retail Value (1,000 lbs.) (1979 dollars)	CONSUMPTION Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1979 dollars)	IMPORTS % Import	Retail Value of Import ($1,000)	EXPORTS % Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of CA Consumption
VEGETABLES, FRESH (cont.)									
Mushrooms	77,776.96	121,332.06	63,541.26	99,124.37			18.3	22,203.77	
Onions	1,081,376	194,647.68	348,300.24	62,694.04			67.8	131,953.64	11,466
Pepper, Bell	137,448	114,081.84	82,368.3	68,366.14			40.1	45,715.70	5,034
Potatoes	2,007,552	281,057.28	2,824,056	395,367.84	28.9	114,310.56			78,895
Winter	79,200								
Spring	1,106,000								
Summer	269,600								
Fall	636,400								
Spinach	44,880	18,400.8	11,766.9	4,824.43			73.8	13,576.37	839
Sweet Potatoes	141,120	46,569.6	134,142.66	44,267.08			4.9	2,302.52	9,030
Tomatoes	571,710	354,460.2	298,879.26	185,305.14			47.7	169,155.06	16,886
Eggplant	NC		16,473.66	7,248.41					
VEGETABLES, PROCESSED									
Asparagus (total)	33,575.92		8,942.84						
Frozen	4,848.48	8,290.9	1,882.70	3,219.42			61.2	5,071.48	
Canned	28,727.44	40,505.69	7,060.14	9,954.79			24.6	18,772.64	
Beans (Total)	36,517.68		170,149.37						44,551
Frozen	4,028.56	1,611.42	28,946.57	11,578.63	86.1	7,550.07			
Canned	32,489.12	10,396.52	141,202.8	45,184.89	77.0	34,788.38			
Cucumbers (Pickles)	10,240.42	7,782.72	202,390.68	153,816.92	94.9	145,972.26			64,699
Peas, Green (Total)	48,476.09		116,256.97		58.3				29,654
Frozen	13,084.09	6,280.36	40,948.81	19.655.43	68.0	13,375.07			
Canned	35,392	13,448.96	75,308.16	28,617.1	53.0	15,168.14			
Spinach									
Winter (Total)	186,598.58		36,006.71						2,007
Frozen	68,135.63	25,210.18	17,179.67	6,356.48			74.8	18,853.7	
Canned	118,462.95	43,831.29	18,827.04	6,966.0			84.1	36,865.29	

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CALIFORNIA FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight (1,000 lbs.)	Retail Value (1,000 lbs.) (1979 dollars)	CONSUMPTION Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1979 dollars)	IMPORTS % Import	Retail Value of Import ($1,000)	EXPORTS % Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of CA Consumption
VEGETABLES PROCESSED (Cont.)									
Tomatoes	5,611,329.9		555,397.68				90.1	1,949,762.06	
Canned Whole	1,905,660.4	666,981.14	129,435.47	45,302.57			93.0	621,678.58	
Catsup, Sauce, Pulp, Puree	2,715,768	1,194,937.92	360,067.14	144,026.86				1,050,911.06	
Tomato & Vegetable Juice	989,901.5	277,172.42	65,894.64	18,450.50				258,721.92	
Carrots	191,322.18		37,418.74						1,260
Frozen	117,796.77	50,652.61	25,651.84	11,030.29			78.2	39,622.32	
Canned	73,525.41	28,674.91	11,766.9	4,589.09			84.0	24,085.8	
Beans, Lima	135,392.61		21,415.76						5,726
Frozen	58,296.50	34,394.94	12,002.24	7,081.32			79.4	27,313.6	
Canned	77,096.11	43,173.82	9,413.52	5,271.57			87.8	37,902.25	
Broccoli									
Frozen	221,936.74	139,820.15	32,241.31	20,312.02			85.5	119,508.13	2,909
Cauliflower									1,080
Frozen	83,895.36	55,370.94	11,766.9	7,766.15			86.0	47,604.78	
Pumpkin & Squash									
Canned			14,120.28						
Corn			177,209.51						
Frozen	NC		47,773.61	23,409.07					
Canned	NC		129,435.9	49,185.64					
Onions									
Frozen	NC		17,650.35						
Olives	118,000	267,860							
Chili Peppers, dried	23,760	11,088							

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CALIFORNIA FOOD IMPORTS

	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
COMMODITY	Retail Weight (1,000 lbs.)	Retail Value (1,000 lbs.) (1979 dollars)	Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1979 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of CA Consumption
FRUITS, FRESH									
Apples	489,600	269,280	418,901.64	230,395.90			14.4	38,884.1	18,481
Apricots	183,456	177,952.32	2,353.38	2,282.78			98.7	175,669.54	
Bananas	-0-		503,623.32	151,087	100	151,087			
Bush Berries									
Boysenberries	2,800								
Olallieberries	3,200								
Raspberries	1,000								
Cherries	63,112	47,334	14,120.28	10,590.21			77.6	36,731.18	
Citrus									
Grapefruit	366,660	146,664	174,150.12	69,660.05			71.8	77,003.95	9,357
Lemons	1,013,760	608,256	68,248.02	40,948.81			93.3	567,307.19	3,353
Oranges	2,706,300	974,268	287,112.36	103,360.45			89.4	870,907.55	19,839
Navel	1,513,200	544,752							
Valencia	1,193,100	429,516							
Tangerines	101,520	55,836	35,300.7	19,415.39			65.2	36,405.07	3,025
Dates	49,000	8,942.84							712
Figs	74,200		4,000.75						604
Grapes, Table	751,660	501,328	72,954.78	58,363.82					5,940
Melons									
Cantaloupe	745,384	268,338.24	169,443.36	60,999.61			77.3	207,338.63	11,434
Honey Dew	241,230	127,851.9							
Watermelon	280,440	86,936.4	294,172.5	91,193.48	4.7	4,257.08			14,371
Nectarines	326,800	774,516	32,947.32	78,085.15			89.9	696,430.85	1,674
Peaches	1,723,160	1,035,992.8	129,435.9	76,367.18			92.49	940,297.22	4,582
Pears	666,307.2	312,331.5	58,834.5	26,475.53			91.2	273,362.72	3,338
Pineapple	-0-		30,593.36	8,260.36	100	8,260.36			
Plums	332,500	119,700	40,007.46	14,402.69	12.3	1,771.53			3,297
Strawberries	316,480	330,820.8	42,360.84	40,666.41			86.6	263,154.39	1,118

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CALIFORNIA FOOD IMPORTS

	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
COMMODITY	Retail Weight (1,000 lbs.)	Retail Value (1,000 lbs.) (1979 dollars)	Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1979 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of CA Consumption
PROCESSED FRUIT PRODUCTS									
Dried Fruit									
Prunes	266,000	502,740	10,825.55	20,460.29			95.9	491,914.45	3,036
Raisins	604,600	961,314	44,008.21	69,973.05			92.7	891,340.95	17,513
Apricots	10,680	42,720	1,412.03	5,648.11			86.7	37,071.89	
Peaches	3,600	10,800	235,338	706.16			93.4	10,087.2	
Pears	3,060	9,180	235,338	706.16			92.3	8,473.14	
All Canned Fruits	2,273,800		442,435.44						
All Canned Fruit Juice			538,924.02						
Frozen Fruit Juice	93,600		289,465.74						
GRAINS									
Wheat, total									700,555
Wheat Flour	3,212,640	1,188,676.8	2,729,920.8	1,010,070.7			15	178,301.52	
Wheat Cereal	80,316	36,142.2	68,248.02	30,711.61			15	5,421.33	
Pasta Products	199,044	151,273.44	167,089.98	126,988.38			16.1	24,355.02	
Rye	NC		16,473.66	6,095.25					
Oats	149,600	91,256	75,308.16	45,937.98			49.7	45,318.02	4,279
Corn, Meal	NC		181,210.26	50,738.87					
Corn Cereal	NC	54,127.74	20,027.26						
Corn Starch	NC		44,714.22	23,698.54					
Barley	2,275,200	659,808	28,240.56	8,189.76					
Rice, Milled	3,367,000	3,097,640	216,510.96	199,190.08			93.6	2,898,449.92	33,567

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CALIFORNIA FOOD IMPORTS

COMMODITY	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		Acres Required to produce 100% of CA Consumption
	Retail Weight (1,000 lbs.)	Retail Value (1,000 lbs.) (1979 dollars)	Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1979 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	
SEEDS AND NUTS									
Dry Beans	252,000	118,440	150,616.32	70,789.67			40.2	47,650.33	122,525
Dry Peas	NC		9,413.52	2,824.06					
Peanuts	NC		14,826.29	16,308.92					
Tree Nuts									
Almonds (Shelled)	322,000	608,580	10,590.21	20,015.50			96.7	588,564.5	10,570
Pistachio	27,200	81,328							
Walnuts	396,000	1,184,040	11,766.9	35,183.03			97.0	1,148,856.97	5,417
Cane And Beet Sugar			2,143,929.18	643,178.76	99.2	340,286.91			
Sugar Beets	1,341,054	402,316.2							
Honey	32,272	41,953.6	30,593.94	39,772.12			5.2	2,181.59	
Coffee, Tea, Cocoa	NA		280,052.22	575,001.34					
Wine Grapes	3,230,000		894,039.49						85,899
TOTALS	75,158,833.79	$31,766,054.25	34,771,413.62	21,417,258.06		7,847,905.85		$19,201,148.49	14,002,487

Chart Notes

a. Production figures are taken from California Crop and Livestock Reporting Service publications and converted to retail weight by U.S. Department of Agriculture conversion factors.

b. California consumption is based on U.S. per capita consumption figures from Food Consumption, Prices, and Expenditures, U.S.D.A. Statistical Bulletin No. 656, 1981.

c. Land requirements based on: William Lockeretz, Agricultural Resources Consumed in Beef Production, Center for the Biology of Natural Systems, June 1975, p. 16.

d. Veal is a by-product of the dairy industry, so land area would be included in dairy products.

e. Production of fish and shellfish from California Department of Fish and Game.

f. Not applicable.

g. Data not collected by U.S.D.A., California Crop and Livestock Reporting Service or other sources.

Food-Related Organizations for Consumers*

Alternative Agricultural
Development Project
Dru Rivers
Dept. of Land, Air and Water
Resources
139 Hoagland Hall
University of California
Davis, CA 95616
(916) 752-7645

Appropriate Technology Farm
and Garden Project
Campus Activities Redwood Bldg.
University of California
Santa Cruz, CA 95064

California Agrarian Action Project
P.O. Box 464
Davis, CA 95617
(916) 756-8518

California Cooperative Federation
P.O. Box 195
Davis, CA 95616

California Department of Consumer Affairs
Cooperative Development Program
1020 N Street
Room 501
Sacramento, CA 95814

California Department of Food
and Agriculture
1220 N Street
Sacramento, CA 95814
(916) 445-5141

California Federation for Technology
and Resources
2018 P Steet
Sacramento, CA 95814
(916) 448-3851

California Green Thumb
401 Seventh Street
P.O. Box 1089
Petaluma, CA 94953
(707) 763-0652

California Institute for Rural
Studies
P.O. Box 530
Davis, CA 95617
(916) 756-6555

Campaign for Economic Democracy
409 Santa Monica Blvd., #214
Santa Monica, CA 90401
(213) 393-3701

Central Coast Counties
Development Corporation
1121-A North Main Street
Salinas, CA 93906
(408) 757-5231

Common Ground Garden Program
155 W. Washington Blvd. Room #606
Los Angeles, CA 90015
(213) 736-2445

Community Network for Appropriate
Technologies
1321 Cleveland Avenue
Santa Rosa, CA 95401
(707) 528-6543

Confederacion Agricola de
California, Inc.
2212 N. Main
Salinas, CA 94906
(408) 443-4550
or
P.O. Box 1154
Salinas, CA 93902

Cooperative and Communal Living
Network
P.O. Box 5446
Berkeley, CA 94705
(415) 849-1835

Earthwork-Center for Rural Studies
3410 19th Street
San Francisco, CA 94110

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* This is a listing of some groups you may want to contact for further information.

Ecology Action of the Midpeninsula
2225 El Camino Real
Palo Alto, CA 94306
(415) 328-6752

The Farallones Institute
Rural Demonstration Education
Community
15290 Coleman Valley Road
Occidental, CA 95465
(707) 874-3060
and
Urban Demonstration Project
The Integral Urban House
1516 Fifth Street
Berkeley, CA 94710
(415) 525-3795

Friends of the Earth
124 Spear Street
San Francisco, CA 94105
(415) 495-4776

Greenpeace Foundation
Fort Mason, Building E
San Francisco, CA 94123
(415) 474-6767

Hunger Project
1735 Franklin Street
San Franciso, CA 94109
(415) 775-8100

Institute for Food and
Development Policy (IFDP)
1885 Mission Street
San Francisco, CA 94110

International Tree Crops
Institute U.S.A.
P.O. Box 1272
Winters, CA 95694
(916) 795-2440

Monterey County Pesticide Coalition
P.O. Box 3923
Salinas, CA 93912
(408) 757-6254

National Consumer Cooperative Bank
Western Region Office
620 Central Avenue
Bldg. 1
Alameda, CA 94501
(415) 273-7576

National Land for People
2348 North Cornelia
Fresno, CA 93711
(209) 233-4747

New School for Democratic Management
256 Sutter Street
San Francisco, CA 94108
(415) 543-7973

Northcoast Environmental Center
1091 H Street
Arcata, CA 95521
(707) 822-6918

Office of Appropriate Technology
1600 Ninth Street
Sacramento, CA 95814
(916) 445-1803

People for Open Space
46 Kearny
San Francisco, CA 94108
(415) 543-4291

Permaculture Institute
P.O. Box 1100
Winters, CA 95694

The Plan: Community Food Tree Nurseries
P.O. Box 872
Santa Cruz, CA 95061

Round Valley Agrarian Community
Development Corporation
Route 1, Box 44B
Covelo, CA 95428
(707) 983-6184

Sierra Club
530 Bush Street
San Francisco, CA 94108
(415) 981-8634

Small Farm Center
TB-102
Universtiy of California
Davis, CA 95616
(916) 752-6690

Steering Committee for
Sustainable Agriculture
P.O. Box 464
Davis, CA 95617
(916) 756-8518

Tree People
California Conservation Project
12601 Mulholland Drive
Beverly Hills, CA 90210
(213) 769-CONE

The Trust for Public Land
82 Second Street
San Francisco, CA 94105
(415) 495-4014

University of California Appropriate
Technology Program
2043 Bainer Hall
University of California
Davis, CA 95616
(916) 752-7166

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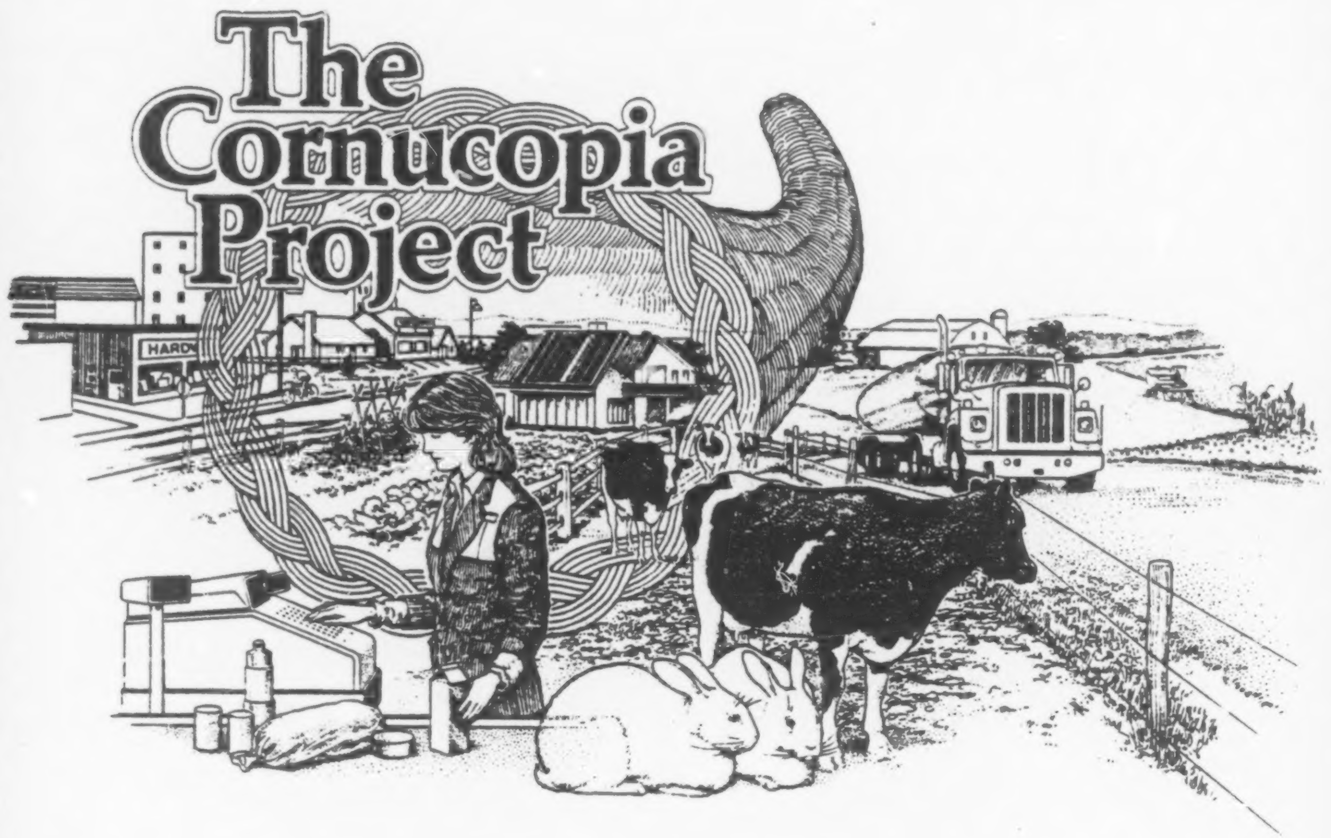

The Colorado Food System:

AVERTING HARD TIMES IN HIGH COUNTRY

A Study of the Colorado Food System
by

PHILIP De BRUYN

and

The Cornucopia Project of the
Regenerative Agriculture Association
33 East Minor Street
Emmaus, Pennsylvania 18049
(215) 967-5171

1983

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Introduction

Agriculture is Colorado's biggest industry and a source of considerable pride for many Colorado residents. In 1980 there were 26,500 farms and ranches in Colorado, totalling 36.5 million acres. These farms and ranches produced cash receipts from farm marketings of just over $3 billion. Colorado produces crops of national importance, ranking third nationally in the production of storage onions, fourth in lettuce and tomatoes, sixth in pears and eleventh in all cattle and calves.

As bright a picture as these statistics may paint, it is not a complete picture. To get the complete picture, there are other statistics that must be considered.

* 44.5 percent of the food consumed in Colorado is imported from other states and countries.

* Transportation for imported food costs Colorado consumers about $3.8 million every year.

* Between 1967 and 1977, Colorado lost 700,000 acres of cropland to urban build-up and transportation and water uses.

* Each year 265 million tons of topsoil are eroded from Colorado's farmland -- enough to cover Denver with two feet of soil.

* The Ogallala Aquifer, the source of irrigation water for over 500,000 acres of Colorado farmland, is expected to be seriously depleted in 30 years.

These are symptoms of an unhealthy dependence on a system over which we currently have very little control. Our food is brought to our tables by a complex food system of farmers, harvesters, packers, shippers, processors, wholesalers and retailers. Many steps can be taken to improve this food system. This report will address some of the major issues confronting our food system, and will recommend ways of increasing local control of this complex system.

Our dependence on distant food sources makes us vulnerable to problems and weaknesses in the national system. Fluctuations in energy prices, heavy rains, early freezes and labor disputes are a few of the situations that could lead to prohibitively high prices for food or even shortages.

A strong food and agriculture system will benefit Colorado consumers in many ways. A regional food system is an insurance policy against the instabilities and weaknesses in the national system. Agriculture is an industry that provides jobs and economic benefit throughout the entire economy. Also, food grown closer to home is fresher and less expensive. Although it may not be easy, the people of Colorado can make changes in the structure of the food system. To this end, the recommendations section of the report is tailored for all of us. There are things that the consumer can do as well as the farmer, food industry, researcher, and local and state policymaker. We all are in it together and it is together that we need to work to create the kind of food system that will assure our children and our grandchildren an affordable and secure supply of food.

Food Imports

Even though agriculture is Colorado's biggest industry, about 44 percent of the food we eat is imported from other states. While it may not surprise anyone that all of our oranges, bananas, artichokes and grapefruit are imported, it is surprising that we import 151 million pounds of fruits and vegetables that could be grown in Colorado.[1]

Food imports represent about $1.4 billion of our food expenditures. Since only 28 percent of this remains with Colorado's retailers, that means that one billion dollars leaves Colorado each year to pay for imported food.[2] Agriculture has a multiplier effect throughout the economy. According to a study by the Department of Commerce, every dollar of output from the livestock sector of farming generates $2.78 of total product throughout the economy on its way to final consumption.[3] Every dollar of output from the crop sector generates $1.81 of total product.[4] A strong farming sector not only generates income, but provides jobs for non-farm workers.

Buying food that is produced out-of-state means paying higher transportation costs. Each year about 3,785 trucks loaded with fruits and vegetables roll into Colorado from Texas, California, Washington, Arizona and other states.[5] It costs about $1,200 to ship a truckload of produce from California's Imperial Valley to Denver.[6] Colorado consumers pay for these transportation costs in the form of higher food prices.

Another aspect of importing our food is diminished quality. Much of the imported fruits and vegetables are picked prematurely before nutritional value is at its maximum, and ripened by ethylene gas in transit.

Studies have shown that vine-ripened tomatoes, for example, have 25 to 30 percent more vitamin C than those picked green and ripened in transit.[7]

But most importantly, our food supply is vulnerable. Because we depend on outside producers for our food, our supply is uncertain. An oil embargo or energy shortage, a labor dispute, a Med-fly invasion, a drought or crop failure in Florida or California -- any of these could lead to shortages. California produces over 40 percent of the nation's fresh fruits and vegetables and 53 percent of our processed fruits and vegetables.[8] Any failure along this supply line could have disastrous consequences.

These scenarios are not just fantasy. The oil embargo of 1973 had serious effects on food, including higher prices, unavailability of some food products, panic buying, and rationing of the products available.[9] A similar disturbance today would have equally serious consequences. Because of inflation and high interest rates, grocery store, warehouse and food processor back-up inventories are even lower than usual. Winter storm warnings often cause local stores to empty out. If something similar happened on a state-wide scale, many of us could soon be hungry. If a supply disruption lasted long enough, social order in food-short urban areas could even break down.

The current system of food imports costs the state valuable economic activity, costs the consumer money to pay for food of lesser quality and leaves our food supply vulnerable to disruptions. As the food system becomes more self-sufficient, Colorado will need to expand its food production as well as facilities for processing, storage and distribution.

Agricultural Land Use

Colorado is a popular state. Since 1970, the state's population has grown by thirty percent.[10] The Front Range alone is expected to gain a million people by the year 2000.[11] Forty percent of Colorado's total farm production comes from this heavily populated area, and competition for farmland is becoming keen.[12]

Statewide, the amount of cropland in Colorado has declined from 11.8 million acres in 1967 to 11.1 million acres in 1977.[13] Between 1960 and 1980, the Front Range alone lost 1.3 million acres of agricultural land to urban build-up.[14] Not included in these figures are the additional acres that are isolated or severely inhibited by the non-farming activities surrounding them.

Conversion of cropland to non-agricultural uses threatens the production potential and efficiency of the agricultural sector. Urbanization of rural areas reduces the intensity and efficiency of farming. Unfortunately, conversion of farmland goes unnoticed by most people. Today, nobody is faced with the consequences of a diminished farmland base. If we keep building on or paving over our best cropland, the land required to feed Colorado residents may not be available when we need it. Once paved over, an acre of cropland can no longer be used for growing crops.

The land most favored for development is also our most productive farmland. This prime farmland is level, well drained and requires few conservation measures. If agriculture is forced to move to more marginal land, farming will become more expensive. Marginal land requires careful management because it is prone to erosion, and it needs higher applications of fertilizers because it is less fertile than prime cropland. This makes farming on marginal cropland more expensive, and these increased costs are bound to be passed along to the consumer in the form of higher food prices.

The Colorado Department of Agriculture has studied the transfer of land from agricultural to non-agricultural use and has come up with the following conclusions.

1. Agricultural land transfer to other uses, with resulting production losses and environmental consequences occurs mainly on the Front Range. Speculation has already driven land prices above $3,000 per acre, which is far above its agricultural value.[15] This creates a strong incentive for farmers to sell out to developers. Boulder, Larimer, and Weld counties together are expected to lose 25,000 to 75,000 acres of agricultural land by 1990.[16] Between 1973 and 1977, Larimer County alone approved 125 subdivisions of land, requiring 10,000 acres of land to be taken out of agricultual production.[17] Current law stipulates that any agricultural land tract that is subdivided into lots of less than thirty-five acres is subject to review and regulation. But the soil conservation districts that deal with the reviews feel that their recommendations go unheeded and that reviews are often bypassed by developers and farmers alike.[18]

2. Decline in quality of agricultural land with resulting production losses and economic consequences occurs on the Eastern High Plains. Increasing soil erosion and decreasing ground water supplies make it difficult for farmers to make a living from farming. Farmers simply do not have enough money to invest in long-term conservation practices. State financial support for conservation

activities in Colorado is among the lowest in the nation.[19]

Currently, about 400,000 acres of cropland in the Eastern High Plains is irrigated with groundwater from the Ogallala aquifer. Since the Ogallala is not connected to any stream or river, it is essentially a non-renewable resource. If this 400,00 acres of irrigated cropland were to revert to dryland farming, the state's economic loss would be between $166 million and $677 million annually.[20]

3. On the Western Slope, farmers, ranchers, and orchardists face pressures on agriculture from the development of the energy industry. At present the primary issues are the movement of the labor force away from agriculture into the energy industry and the influx of people employed by the energy industry who are settling on agricultural land.[21]

Currently, land and water resources are sufficient for both the energy industry and agriculture. In the future, however, competition for land will be based on the rate of growth in the energy industry, the water supply policies of energy companies, and the extent to which energy resources are converted within the state.[22]

Soil Erosion

Conversion of farmland to non-agricultural uses is not the only way Colorado is losing its land. A more subtle, but no less severe loss is through soil erosion. Topsoil is the most fertile part of the soil. It contains most of the organic matter, stores more than half of all nutrients and holds water vital for maintaining soil structure. Formation of topsoil is a slow process that can take hundreds of years. Today we are losing more than 11 tons of soil per acre of cropland each year, more than twice the national average.[23]

Plowing fragile grass-lands, intense monoculture on marginal land, and lack of public and private conservation measures all contribute to the problem. Wind erosion alone damages 4.5 million acres of cropland above accepted erosion rates.[24] Wind, sheet, and rill erosion together cause the loss of 265 million tons of topsoil each year.[25] This is enough soil to cover Denver with over two feet of topsoil every year.[26] Each year, 50 million tons of nitrogen, phosphorus and potassium are lost from cropland because of erosion. The estimated annual replacement value for these soil nutrients is $6.8 billion.[27]

Erosion is getting worse. In 1967 half of the state's cropland and rangeland needed conservation treatment.[28] By 1977, the Soil Conservation Service estimated that more than two thirds of all crop and rangeland needed conservation treatment.[29] Part of this increase is due to marginal land being brought into production. In 1980, only 11 percent of Colorado's farms participated in agricultural conservation programs.[30]

To make matters worse, the proposed 1983 Soil Conservation Service budget will be cut by almost 25 percent.[31] Only $10 million of Federal money in block grants is budgeted to state allocators.[32] According to the USDA, ten times this amount is needed in order to have any significant effect on state conservation programs.[33] Farmers, already burdened by rising expenses and falling prices, cannot be expected to invest in long-term conservation programs of their own.

Water

Water is a very important input in agricultural production in Colorado. Two thirds of the value of crops generated in the state comes from irrigated acreage.[34] Ninety percent of the state's total water consumption is for agricultural production alone.[35] It is estimated that a decrease in irrigated acreage of 20 percent could cut the state's economy by $500 million a year.[36]

Colorado is legally entitled to use about eight million acre-feet of surface water per year (an acre-foot is about 326,000 gallons).[37] Additional water is provided by aquifers. Currently, Colorado uses between six and seven million acre-feet of water per year.[38] But water supplies are unevenly distributed. The South Platte River is over-appropriated; more water is required than the system can provide. At the same time, 325,000 acre-feet of water flow out of Colorado each year.[39] There are several ways of increasing Colorado's water supply: 1) increase regional water supply through diversions from the Western Slope; 2) increase municipal supplies by acquiring agricultural water; 3) reduce municipal demand through water conservation; 4) increase water supply by storing additional water and reducing the flow of water out of the state.

Different sectors of Colorado's economy vie for the state's water supply. Table 1 illustrates the quantity of water required to produce one dollar of output for each of Colorado economic sectors. Irrigated agriculture is by far the most extensive user of water of all the state's industries. Irrigated agriculture requires 3.5 times as much water to produce a dollar of output as its nearest competitor, livestock, and almost ten times as much water

Table 1

GALLONS OF WATER CONSUMPTIVELY USED TO PRODUCE ONE DOLLAR OF OUTPUT

(COLORADO, 1970)

Irrigated Agriculture	4,331
Livestock	1,241
Food Processing	613
Trade	128
Metal Mining	58
Dryland Agriculture	44
Electric Power Generation	35
Services	28
Other Manufacturing	28
University Education	23
Elementary and Secondary Education	22
Wood Products	19
Primary Metals	15
Industrial Minerals Production	13
Transportation, Communication, and Public Utilities	13
Chemicals	10
Mining Services	9
Petroleum Refining	9
Coal Mining	7
Petroleum Production	7
Natural Gas	6
Pipeline Transportation	5
Fabricated Metals	5
Electronics	2
Paper	2
Printing	2
Textiles	1

Source: An Economic Analysis of Water Use in Colorado's Economy, D. Lee Gray and John R. McKean, Colorado State University, December 1975.

as dryland farming. As the demand for water increases, irrigated acreages and irrigation water will tend to be used for activities that produce a higher economic output.

State-wide irrigated acreage has increased by 26 percent over the last 20 years.[40] Almost all of this gain is the result of the development of the Ogallala Aquifer in Colorado's eastern High Plains.[41] The Ogallala Aquifer lies under parts of six Plains states, and supplies irrigation water for this area. The Ogallala is currently being mined at a rate that will cause severe depletion in less than 30 years.[42] Withdrawal rates are up to 5 feet per year at some places, while natural recharge is no more than 2 inches per year.[43]

That water issues will become critical in the near future is apparent from the following. Conservative estimates set the water requirements to produce the crops and livestock to feed one person at 1,000 gallons/day.[44] This is equivalent to about one acre-foot per person per year. The state population is projected to reach 4 to 4.7 million by 2000.[45] That means consumption of 4 to 4.7 million acre-feet of irrigated water, about 2 million more than is used today, bringing the state's total water use above allocated limits.

Colorado State University and the Department of Agriculture are studying water efficient crops to evaluate their potential for production and processing in the state, but any significant results will take some time to reach commercial scale.[46] When dryland farming once again becomes the predominant production practice, farm management systems will need to be finely tuned to include practices like skip-row planting and land terracing to capture precipitation.

Farm Expenses

Increase in farm size, declining soil fertility, technological advancements and rising prices for agricultural inputs have put the farmer in a position today where he is becoming dependent on purchased inputs that cost him more money and yield him less income. Over the last half century, technology and the trend toward larger farm size have steered agriculture in a capital-intensive direction. At the same time, productivity has risen sharply, leaving the farmers with flooded markets, depressed commodity prices and high production costs. In western Colorado the force driving farmers to adopt capital intensive labor-saving methods is amplified as the energy industry lures labor away from agriculture.[47]

Farmers are caught in a "cost-price squeeze," the cost of farming increases while the prices farmers receive for their crops decrease. Between 1975 and 1980, total farm production expenses in Colorado increased by 92 percent, while net farm income dropped 12 percent.[48]

For many farmers, the only way to stay in business is to buy more land and increase production. Farmers usually borrow money to do this, using their land as collateral. This has been possible because farmland value has been steadily increasing. Between 1978 and 1981, Colorado's farm real estate debt rose 97 percent, from $1.08 billion to $2.14 billion.[49] During the same time period, farm real estate value in Colorado increased only 51 percent.[50]

Unfortunately, this strategy has not been particularly successful. Farm income still lags far behind farmers' production expenses. In addition, farmland prices are leveling off or dropping, making further refinancing questionable.

The average national farmland value declined by one percent between 1981 and 1982, the first decline since 1955.[51] Farmland values in the mountain states are still rising, but the change in real value, after adjustment for inflation, is actually decreasing. This could snowball into financial disaster for Colorado's farmers.

Economics

If the food system had a motto, it might be "bigger is better." In the past fifty years, farms have increased in size, food processors have become huge multinational corporations and local grocery stores are rapidly being replaced by statewide chains of "super stores."

In agriculture, evidence of this trend is easy to find. In 1978, 27 percent of the farms in Colorado sold 92 percent of the agricultural production, and 14 percent of the farms held over 70 percent of the total farmland.[52] In 1980, only 5.5 percent of the feedlots in the state marketed 57 percent of the cattle for slaughter.[53]

The growth of large farms raises questions about equity and flexibility. Bigger is not necessarily a better method of production. On grounds of efficiency alone, USDA research on United States field crop farms found the most efficient size in the Texas High Plains (similar to the Colorado High Plains) is 974 acres.[54] But 90 percent of this efficiency can be achieved by farms of 395 acres.[55] The income from the smaller farms however, is 30 percent lower.[56] One reason for the increasing farm size is the higher income derived from them. Bigger farms in the hands of fewer owners increases the vulnerability of the food supply, limits food diversity, and puts the decisions of what foods are grown and how much consumers pay for them in the hands of fewer farmers.

The kind of structural information cited above is harder to obtain for the food manufacturing industry. Examples rather than statistics must be used to reflect recent trends. Often processors merge, grow, and expand markets to the extent that they are virtually the only market available to the farmer for certain commodities. Fort Lupton Company contracted all the peas grown in Colorado and 50 percent of the snap beans.[57] Kunner Empson Canning Company contracted almost all the red beets in the state,[58] and Peabey Milling Company milled about 95 percent of the wheat milled in Colorado.[59] A decrease in the number of processors has several consequences. Fewer processors lowers competition in the processors' input market, and creates a market power imbalance, forcing farm prices down. Second, fewer processors makes farmers vulnerable to plant closings. If a processor closes, farmers may lose a major part of their market. Fort Lupton and Kunner Empson have recently gone out of business, and as a result none of the commodities which they processed are grown in Colorado anymore. Third, political power of these big companies is strong. An agricultural marketing bill introduced to give farmers more equitable leverage in the market was recently killed by lobby groups of two sugar companies and one brewing company that virtually control their input markets.[60] Finally, the growth of these giants costs the consumer out-of-pocket money. Nationally, monopoly overcharges in the food manufacturing industry are estimated to be over $10 billion or over 6 percent of food sales in 1975.[61] Thus, a declining number of processors can be linked to lower farm prices, declining crop diversity, increasing rigidity in the system and higher consumer food prices.

At the retailing end of the food system, concentration is also very high. In Denver, two supermarket chains, King Sooper and Safeway, have about 90 percent of the grocery retailing market and 80 percent of the meat retail market.[62] Statewide, King Sooper and Safeway capture about 75 percent of the retail market in food.[63] This is a recent trend and is growing fast. Both chains have opened about half of their stores since 1975.[64] Mergers of retail grocery chains, another method of gaining market share, have been linked to the relaxed attitude that United States antitrust agencies have been taking on food industry mergers since the mid-1970's.[65] These large grocery chains have the ability to use strategies not available to smaller grocery stores operating in one local market. This results in a decrease in competition and its consequences. A study undertaken for the U.S. Congress has concluded a positive relationship between relative market dominance of a grocery chain and its profits, and relative retail food prices. [66] Left unrestrained then, this trend could result in inflated retail food prices, unrelated to production costs or the well-being of farmers.

Fertilizers

Between 1975 and 1980 the direct application of nitrogen solution has increased by 216 percent , while the application of natural organic material has gone down by 84 percent. [67] Often application is in excess of the needed amount. Fertilizer companies provide the farmer with the services of collecting their soil samples and having them tested at commercial testing laboratories. In almost all cases where duplicate tests were run by the Colorado State University, deficiencies claimed by the commercial labs were not found by the University labs.[68]

The total amount of primary plant nutrients in mixtures and direct application material consumed in Colorado in 1980 totalled 186,000 tons of nitrogen and 48,777 tons of phosphorus.[69] This costly approach to fertilizing may not be entirely necessary. Annually, the amount of recoverable nutrients in the livestock and poultry manure production of the state, for example,could satisfy 18 percent of the nitrogen and 21.4 percent of the phosphorus requirement.[70]

The current supply of fertilizer material is not only expensive, but also unstable. Florida produces 75 percent of the United States' supply of phosphorus and its mines are estimated to last only another 30 years.[71] After that, phosphorus will come from foreign sources. Nitrogen fertilizer is made from a process that utilizes natural gas. Decontrol of natural gas could raise the prices for ammonia from $80 to $500 per ton.[72]

If prime farmland is taken out of production for non-agricultural uses, farmers will be forced to cultivate marginal farmland, which needs higher fertilizer applications to maintain production levels. By maintaining both the amount and quality of Colorado's farmland, farmers will be less dependent on distant and possibly unreliable fertilizer sources.

Food Availability and Waste

Despite the state's highly productive food system, there are still people in Colorado who cannot afford an adequate diet. In July 1982, 61,514 households were receiving food stamps.[73] Although the government annually spends more than $6.6 million on food stamp programs in Colorado,[74] it is estimated that 40 percent of those people eligible for food assistance do not participate.[75] As federal spending programs are trimmed, Colorado will need to develop ways to feed its needy.

While some Colorado consumers go hungry, food is being wasted. Each year in Colorado, approximately 58 million pounds of food worth $54 million are wasted as the result of damage and spoilage in transportation, wholesaling and retailing.[76] This much food would have fed 38 thousand people.[77] Prior to the introduction of the gleaning bill in Colorado in 1982, 38 million pounds of vegetables and 4 million pounds of fruit were plowed under each year.[78] The major reason for this was over-contracting by processors, with subsequent breaches of contracts, which left partially compensated farmers without a market for this excess production.

The Colorado food sytem has the capabilities to provide all Colorado consumers with an adequate diet. The different sectors of the system, from farmers to processors to wholesalers and retailers to consumers can achieve this goal only by working together.

RECOMMENDATIONS

Although there are many ways in which the current food system can be improved, only a few key issues will be dealt with here. The great diversity of concerns will prevent any generalizations and therefore the recommendations should be taken as guidelines needing adjustment before application. All the components of the food system need to be put into perspective. The increasing interdependence among the many different parts of the food system dictates a comprehensive approach to any problems. Too often the lack of any coordination between the different parts prevents solutions from being reached. The only way the whole can be bigger than the sum of the parts is by cooperation and coordination among all parts and at all levels. Effective cooperation needs comprehensive information available to all involved, and the use of that information to make plans and decisions with the input of all involved, toward a more flexible, economically viable and environmentally sustainable food system.

Major Themes

I. In-State Production for In-state Consumption

Colorado is currently in a relatively good position concerning interstate trade in agricultural and food products. Its inflow of export dollars far exceeds its outflow of import dollars. But there are trends in this structure which are unlikely to reverse and will cause negative consequences in the near future. First, Colorado relies heavily on the beef industry for its exports. This industry uses large quantities of water including feed production on irrigated acreage. Water in Colorado will become a scarce commodity in the near future, which will probably drive feed production out of this naturally dry state. This can make beef production uneconomical, thereby destroying the state's biggest agricultural sector. Movement toward greater diversity in the agricultural base should be initiated well ahead of the eventual change since much time is involved in changing the system. Second, transportation costs are rapidly increasing and will continue to do so. Therefore, the costs of a system that relies on in- and out-shipments of large amounts of food are rising and will eventually outweigh the benefits of shipping our food from distant sources. A system, therefore, that relies on production for local consumption will become more and more attractive in the future. Again, now is the time to evaluate and prepare. Third, many states are not as well off as Colorado in their balance of agricultural and food trade. As those states begin to work toward greater self-sufficiency, the market for Colorado exports, as well as the supply of its imports, will decline. We should be aware of this change and prepare alternative production systems that rely less on interstate trade.

Increased self-sufficiency will decrease transportation costs, energy usage and vulnerability to disruptions, while increasing the flexibility and resilience of the system. It will also improve freshness, taste, and nutritional value of products since premature harvesting and long distance transport will be minimized. The variety of fruits and vegetables in Colorado can be greatly expanded. Greenhouses, local processing and storage can be used to extend growing seasons and availability periods.

II. Encourage Local Markets

The benefits from local buying are the same as those mentioned for greater self-sufficiency. Both producers and consumers benefit. A USDA study on direct marketing in Colorado showed that local farmers received a 44 percent higher gross return if they sold locally through direct marketing rather than through wholesale channels.[79] Consumers also gained an average of 28 percent in decreased prices compared to supermarkets.[80] What are needed are locally conducted surveys of all producers willing to sell directly and all large volume buyers. This would help link sellers and buyers.

III. Maintain the Farm Resource Base

The farmers and the resources under their management are the most crucial part of our food system. Therefore, more attention should be given to the disappearance of farmers and farmland before a highly energy and capital-intensive, concentrated farm sector develops that has no desire for stewardship of resources entrusted in its hands. Soil erosion can be curbed through appropriate incentives and disincentives and expanded research on alternative farming practices. The decline of the family farm and the conversion of farmland can be curbed by legislative action and assistance, as well as careful evaluation of the side effects of government programs. The farm's supporting infrastructure of appropriate scale markets, input suppliers, extension services and credit sources needs to be maintained.

IV. Expand Consumer Education and Awareness

In our economic structure, the consumer is the ultimate entity that can exert great power over the direction of the food system. But for consumers to participate actively in food system issues, they meed to be better informed about the system and its problems as well as possible solutions. Education, public information, and formation of consumer groups can channel the powers of consumer demand into an effective tool for change.

RECOMMENDATIONS TO THE STATE GOVERNMENT

1. Promote State Agricultural Production

   a. Offer incentives to farmers to diversify production with assistance from extension agents and low-interest state-guaranteed loans to make changes necessary for diversification. Expand investigation of the potential for various water-efficient crops. Start investigation of production potential of crops now imported into the state. Establish demonstration experiments to test crops, animals, and fish varieties suitable to the state's soil and climate, and develop farming techniques appropriate for smaller scale farms and less reliance on purchased inputs.

   b. Provide tax incentives for small-scale food producers, e.g. not taxing the first $10,000 of income from food produced for local consumption. Initiate programs to provide practical farm skills to small-scale commercial farmers.

   c. Organize a farmer linkage program whereby experienced farmers bring prospective farmers into their operation, easing the transfer of land ownership over time. In this way the new farmer would avoid costly farming mistakes while gaining the experienced farmer's knowledge of the operation.

   d. Encourage the formation of marketing coops for small farms to provide the necessary supplies for large buyers.

2. Farmland Preservation

   a. Publish guidelines to help local governments protect agricultural land and enhance farming. These guidelines would include ways to prevent "leap-frog" or random development, which removes from production not only the land that has been developed, but which in the long run isolates adjacent farming areas and inhibits certain farming activities. It could also include ways to protect farmland in urban fringes. such as agricultural zoning, transfer of development rights, community land trusts, etc.

   b. Institute a farmland capital gains tax which would discourage speculators from investing in farmland, and then re-selling it for development.

   c. Form a state chartered non-profit corporation that has the "right of first refusal" when farmland is being sold. The corporation can subsequently resell with restrictions to keep land in agriculture.

d. Monitor and record agricultural land transfer on an annual basis.

e. Promote family farms with a "Family Farm Security Program" including low-interest loans for the purchase of farm real estate.

f. Reduce capital gains taxes for farmers selling land to young and beginning farm operators.

3. Stop Erosion

a. Establish incentives to reduce erosion, including erosion taxes and prohibition of agricultural activities that result in erosion above a predetermined level.

b. Require a conservation plan for all agricultural lands larger than 25-35 acres.

c. Link assistance programs like loans, crop insurance, disaster relief, price-supports and state purchase of farm commodities to participation in conservation programs.

d. Encourage the use of rental arrangements which include provisions for sharing erosion control between the farmer and the owner.

e. Develop public awareness programs to promote the understanding of the need to support sound soil conservation.

4. Expand Local Markets

a. Develop and fund farmers' markets, including wholesale markets to supply large-volume purchasers.

b. Increase promotional efforts for direct purchase from farmers by supermarkets, restaurants, schools, hospitals, and other institutions. The existing ABC program could be expanded to to include institutional buying and direct marketing.

c. Provide assistance to small growers through a state-wide marketing clearing house.

d. Strengthen in-state food processing capabilities. Create incentives to attract new food processors who wish to reduce transportation costs by locating closer to major distribution centers. Establish community food processing and storage facilities for use by families and small commercial food producers to realize economies in equipment and energy consumption.

e. Recycle organic wastes to utilize their fullest potential. Inventory the state's types and amounts of organic wastes available and assess their potential to improve soil fertility and tilth and their potential for energy use. Develop incentives for using local organic waste as fertilizer and incentives for industry to separate toxic substances from their wastes so they can be safely used on cropland.

4. Promote the Understanding of Agriculture's Role in the Food System

a. Inititate educational programs on farmland preservation, energy conservation, reduced fertilizer and pesticide use, recycling organic wastes, and on energy use in different methods of farming and home food preparation.

b. Continue and expand the "Agriculture in the Classroom" program.

c. Promote nutrition education campaigns illustrating the relationship between diet and health.

RECOMMENDATIONS TO LOCAL GOVERNMENT

1. Create a greater understanding of the importance of agriculture to urban areas through educational programs. Offer seminars in agriculture, aquaculture, food preservation, storage, preparation, and nutrition. Encourage and expand the "Agriculture in the Classroom" program. Establish community gardens and community educational farms to be worked by farmers with interested citizens as labor.

2. Promote contract growing whereby groups of urban families, coops, or the city itself arrange to purchase food directly from local suppliers. Investigate the possibility of consumer/producer coops as an institutional framework for contract growing.

3. Encourage local industries that produce low-grade waste-heat to make use of this energy by producing food in attached greenhouses, or cultivating fish in warm coolant water.

4. Establish farmers' markets in the city, particulary in low income neighborhoods, and facilitate authorization for farmers to accept food stamps at the market. Assist in the formation of food cooperatives, coop stores, and preservation and storage centers by providing credit and guidelines.

5. Establish food banks to collect, store and distribute surplus food. The Colorado Clearing House in Denver is already active in setting up banks in cooperation and with financial assistance from the government.

6. Encourage government institutions to buy food supplies from local producers.

7. Develop an agricultural development council, comprised of people from the entire food system. This would focus on generating solutions to the problem of land conversion. It could develop local markets for local producers, hook up producers with purchasers, promote locally grown products with an expanded version of the ABC program, and initiate educational programs.

8. Investigate the Agricultural Land Evaluation and Site Assessment (LESA) system, now being developed by the Soil Conservation Service and the USDA. The program will assist planners in identifying farmland that should be protected, based on land capability, soil productivity and other important farmland ratings. The Colorado Department of Agriculture itself is currently developing more elaborate maps of the state's land resource and uses criteria such

as market proximity and supporting infrastructure to identify Logical Agricultural Units (LAU's).

9. Cooperate with local conservation districts, so that township supervisors enable the district to review subdivision plans for adequacy of erosion sedimentation control and stormwater management. Enforce greater evaluation of the Soil Conservation Service's reviews on subdivisions of agricultural land.

RECOMMENDATIONS TO FARMERS

1. Land Preservation

   a. Learn about the diversity of services and technical assistance available to farmers through local conservancies and land trusts, which can show the best options for future use of land, including land not essential for farm production. This kind of planning service would help the farmer realize certain economic benefits while still maintaining and preserving his farm operation.

   b. Preserve farmland by decreasing soil erosion, with the assistance of the local soil conservation districts. Reduce soil loss through structural and management practices, e.g. conservation tillage, terracing, contour farming, use of crop residues, and winter cover crops.

   c. Take land that is severely eroded out of production. Use marginal land for livestock grazing instead of crop production.

   d. Have soils tested accurately to determine nutrient value and fertilizer needs in order to prevent overuse of costly, energy-intensive fertilizers. Beware of inaccurate soil testing services.

2. Farm Inputs/Resources

   a. Diversify production with selected combinations and rotations of crops or an interplay of crops with livestock. This practice would reduce fertilizer and weed control costs while providing the farmer with greater market stability.

   b. Diversify not only types of crops but individual strains of a single crop as well so as to reduce the risk of pests blighting the entire crop.

   c. Reduce energy use by investing in more efficient machinery, especially irrigation pumps, and by letting crops dry naturally whenever possible. Investigate possibilities of using alternative energy sources, like manure conversion into methane, solar heat for crop drying, or wind power.

   d. Consider using management practices that will reduce the need for chemical fertilizers, pesticides, and other expensive inputs. Develop on-farm fertilizer sources by growing nitrogen-fixing legumes and green-manure crops.

   e. Avoid routine spray schedules. Apply pesticides only when needed and target spraying to delay onset of insect resistance, reduce undesirable residues, minimize damage to beneficial insects, and decrease costs. Consider alternatives to pesticide use, like integrated pest management. This involves monitoring pest levels for proper timing of application, no-tillage, crop rotations, interplanting, broadcast seeding or narrow rows, and biological control of pests to maintain the natural ecosystem.

3. Marketing/Economics

   a. Organize marketing coops to provide restaurants, schools and other institutions with locally grown food. Work cooperatively with the consumer by selling directly to the public. Locate marketing centers strategically for the assembly, grading, packing, and distribution of the output of many small producers, thereby providing larger buyers with the volume and specifications they require.

   b. Consider small-scale processing on the farm; such as processing sausage, curing meats, preserving, cheese making, etc. Fresh produce can be washed, sorted, and packaged for sale to restaurants and markets.

   c. Encourage local newspapers, if not alreadv provided, to devote space to farm problems and a listing of local and seasonal food availability.

RECOMMENDATIONS TO THE CONSUMER

1. Form a local Cornucopia Project, consisting of people who want to work at changing some aspect of their food system. Activities include establishing community gardens; cooperative food buying, storing, and preserving; forming food banks; gleaning farm fields after harvesting; and lobbying.

2. Purchase locally grown fruits and vegetables in season, taking advantage of peak nutritional value and decreased cost. Process and store these foods for winter consumption.

3. Purchase food directly from growers, thereby increasing their needed financial support as well as enjoying fresh and nutritious food at lower prices. Food coops can contract with farmers to produce for them.

4. Increase participation of the Cooperative Extension Service's Master Gardener program by expanding it to include storage, processing, marketing, growframes and greenhouses.

5. Start a land trust, a non-profit corporation, able to own real property or interest in real property. It can then purchase threatened critical agricultural property and sell it with deed restrictions to new farmers.

Notes:

1. See Colorado Food Imports Chart, p. 36 of this report.

2. U.S. Department of Agriculture, Economics and Statistics Service, Agriculture Economic Report No. 465, Developments in Farm to Retail Price Spreads for Food Products in 1980 (Washington, D.C.: GPO, 1981), p. 24.

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7. Robert S. Harris and Endel Karmas, Nutritional Evaluation of Food Processing (Westport, AVI Publishing Co., 1975), p. 103.

8. California Crop and Livestock Reporting Service, California Vegetable Crops, Annual Bulletin, 1979-80, p. iv.

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11. Ibid.

12. Steven W. Horn, Conservation in Colorado, A Program for Present and Future Needs (n.p.: State of Colorado Department of Natural Resources, n.d.), p. 14.

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16. Ibid., p. 45.

17. Ibid.

18. Horn, p. 14.

19. Agricultural Land Conversion in Colorado, p. 50.

20. Ibid., p. 51.

21. Ibid., p. 54.

22. Ibid., p. 55.

23. Ibid., p. 33

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31. "Cuts in Soil Erosion Programs Worry Farmers," New York Times, 14 February 1982.

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33. Ibid.

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36. Agricultural Land Conversion in Colorado, p. iv.

37. "Resource Analysis," p. 5.

38. Ibid., p. 15.

39. Ibid., p. 5.

40. Ibid., p. 2.

41. Ibid.

42. "What to Do When the Wells Run Dry," *Science*, 14 November 1980, p. 754.

43. Ibid., p. 755, 756.

44. "Resource Analysis," p. 13.

45. Ibid., p. 14.

46. Colorado Department of Agriculture, *Update*, March 1982, p. 4.

47. *Agricultural Land Conversion in Colorado*, p. 57.

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49. *Agricultural Statistics 1981*, p. 475.

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52. U.S. Department of Commerce, Bureau of the Census, *1978 Census of Agriculture*, Vol. 1, part 51 (Washington, D.C.: GPO, 1981), p. 286.

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54. Thomas A. Miller, Gordon E. Rodewald, Robert G. McElroy, USDA, Economics and Statistics Service, Agricultural Economic Report No. 472, *Economies of Size in U.S. Field Crop Farming* (Washington, D.C.: GPO, 1981), p. 20.

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68. "Testing labs push excessive fertilizer," Rocky Mountain Farmers' Union, May 1981, p. 8.

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70. Donald L. Van Dyne and Conrad B. Gilbertson, Estimating U.S. Livestock and Poultry Manure and Nutrient Production (Springfield: NTIS, 1978), p. 20.

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75. Telephone interview with Dave Bell, Department of HEW, Denver, CO, 21 August 1982.

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APPENDIX

COLORADO FOOD IMPORTS

Agriculture is Colorado's biggest industry. In 1980 cash receipts from farm marketings in Colorado totalled just over $3 billion. Colorado produces crops of national importance; the state ranks third in production of storage onions, fifth in all sheep and lambs, sixth in dry beans and twelfth in turkeys. Despite these agricultural success stories, 44.5 percent of the food that is consumed in Colorado is imported from other states. In 1980 we imported 267 million pounds of fresh meats, vegetables and fruits that could have been grown in Colorado.

Colorado has the potential to increase its food self-reliance. In-state processing and storage facilities will help keep Colorado's agricultural production closer to home. A network of wholesale markets can provide large volume food purchasers with the quantities of food they require. Colorado's most productive farmland can be protected and preserved, to ensure vigorous agricultural land base for future generations. These and many other steps can be taken to provide Colorado consumers with a safe, secure, efficient and economical food system.

Retail Value of Colorado Production	$6,709,417,700
Retail Value of Colorado Exports	4,936,925,210
Value of Production Remaining	$1,772,492,490

55.5 percent of consumption produced in Colorado
Colorado imports 44.5 percent of its food

COLORADO FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight[a] (1,000 lbs.)	Retail Value (1,000 lbs.) (1981 lbs.)	CONSUMPTION Retail Weight[b] (1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	IMPORTS % Import	Retail Value of Import ($1,000)	EXPORTS % Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of CO Consumption
Meats									
Beef	891,698.50	2,131,159.40	221,085.0	528,393.15			75.21	1,602,766.25	1,147.139.0[h]
Veal	Insignificant		4,335.0	13,308.45	99.0	13,175.37			
Lamb & Mutton	54,488.0	95,419.41	3,757.0	6,579.26			93.1	88,840.15	450,840.0[g]
Pork	85,815.0	131,296.95	197,387.0	302,002.11	56.52	170,691.60			172,889.0[f]
Poultry									
Chicken	4,200.48	5,208.60	144,500.0	179,180.0	97.09	173,965.86			34,484.0
Turkey	86,564.80	80,528.09	30,345.0	28,228.85			64.94	52,299.24	9,556.0
Eggs	60,577.80	32,480.01	99,994.0	53,613.80	39.42	21,134.56			18,147.0
Fish[e] (fresh, frozen, cured)	1,450.0	3,697.50	36,703.0	93,592.65	96.05	89,895.74			1,589.0[c]
Dairy Products[d]									
Fluid Milk and Cream	535,325.39	493,570.01	722,500.0	666,145.0	25.91	172,598.17			166,103.0
Butter	5,634.0	10,591.92	12,716.0	23,906.08	55.69	13,314.25			45,732.0
Cheese, hard	-0-		50,864.0	121,300.47	100.0	121,300.47			81,774.0
Cottage and Creamed	27,614.0	39,609.52	13,005.0	18,654.37			52.90	20,955.15	7,987.0
Evaporated and Condensed milk	-0-		20,519.0	37,919.11	100.0	37,919.11			3,959.0
Dry Milk Products	-0-		19,652.0	32,246.64	100.0	32,246.64			1,937.0
Frozen Dairy Products	15,219.0	9,676.24	76,007.0	48,325.25	79.98	38,649.09			33,848.0

Continued on next page

COLORADO FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight (1,000 lbs.)	Retail Value (1,000 lbs.) (1981 lbs.)	CONSUMPTION Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	IMPORTS % Import	Retail Value of Import ($1,000)	EXPORTS % Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of CO Consumption
Vegetables, fresh									
Artichokes	NA		867.0	2,830.58	100.0	2,830.58			NA
Asparagus	399.78	629.73	867.0	1,365.70	53.89	735.98			397.0
Broccoli	92.0	47.77	4,913.0	2,550.83	99.98	2,550.31			1,068.0
Cabbage	51,800.0	14,504.0	24,276.0	6,797.28			53.14	7,706.72	658.0
Carrots	26,400.0	8,448.0	17,629.0	5,641.28			33.22	2,806.72	735.0
Cauliflower	953.78	663.07	3,757.0	2,611.87	74.61	1,948.82			1,057.0
Celery	Insignificant		21,097.0	7,172.98	99.00	7,101.25			467.0
Cucumbers	65.0	27.33	11,560.0	4,855.20	99.44	4,827.91			1,277.0
Eggplant	185.24	145.08	1,445.0	1,131.72	87.18	986.64			86.0
Garlic	31.60	86.76	2,312.0	6,347.83	98.63	6,261.11			220.0
Green Peppers	4,538.52	3,993.90	8,806.40	7,749.63	48.46	3,755.78			1,205.0
Hot Peppers	4,080.0		NC						
Lettuce	94,300.0	33,005.0	71,961.0	25,186.35			23.69	7,818.65	3,510.0
Mushrooms	Insignificant		34,095.30	61,712.49	99.00	61,095.37			
Onions	246,000.0	63,960.0	29,478.0	7,664.28			88.01	56,295.72	983.0
Potatoes	1,254,500.0	288,535.0	142,477.0	32,769.71			88.64	255,765.29	8,245.0
Snap Beans	-0-	-0-	3,757.0	3,043.17	100.0	3,043.17			621.0
Spinach	8,600.0	5,978.72	2,023.0	1,406.39			76.48	4,572.33	259.0
Sweet Corn	30,400.0	13,376.0	19,047.0	8,392.56			37.26	4,983.44	2,008.0
Sweet Potatoes	Insignificant	-0-	9,826.0	5,966.35	99.0	5,906.69			921.0
Tomatoes	13,000.0	6,292.0	32,946.0	15,945.86	60.54	9,653.94			1,525.0
Vegetables, canned and frozen									
Asparagus	NC		1,040.40	1,487.77					580.0
Beets	NC		3,468.0	1,312.29					156.0
Broccoli	NC		4,046.0	4,165.76					1,076.0
Brussels Sprouts	NC		722.50	661.23					69.0
Carrots	NC		4,132.60	2,871.70					531.0
Cauliflower	NC		1,329.40	1,555.93					492.0
Lima Beans	NC		2,225.30	1,986.74					757.0
Peas	NC		13,987.60	11,637.66					3,814.0

Continued on next page

COLORADO FOOD IMPORTS

	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
COMMODITY	Retail Weight (1,000 lbs.)	Retail Value (1,000 lbs.) (1981 lbs.)	Retail Weight 1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of CO Consumption
Vegetables, canned and frozen (cont.)									
Onions			1,964.90	1,489.03					81.0
Pickles	61,850.88	34,834.41	19,941.0	11,230.77			67.76	23,603.80	1,127.0
Potatoes	NC		69,360.0	45,853.98					9,440.0
Pumpkin/squash	NC	1,156.0	478.12						124.0
Sauerkraut [1]	742.0	365.66	3,468.0	1,709.03	78.61	1,343.47			175.0
Snap Beans	6,542.64	3,339.36	20,808.0	12,222.62	72.68	8,883.40			2,723.0
Spinach	NC		3,612.50	2,225.30					566.0
Sweet Corn	NC	23,339.70	12,735.77						5,013.0
Sweet Potatoes	NC		2,890.0	1,627.65					315.0
Tomato Products	5,376.80	2,579.31	66,759.0	32,025.03	91.95	29,447.01			5,836.0
Fruits, fresh									
Apples	70,000.0	42,700.0	46,240.0	28,206.40			33.94	14,493.60	9,980.95
Apricots	623.65		NC						
Bananas	NA		60,112.0	29,836.96					NA
Cantaloup	10,600		NC						
Cherries, sweet and tart	3,200.0	5,603.84	1,734.0	3,036.58			45.81	2,567.26	1,836.04
Citrus fruits	NA		80,341.90	42,695.28					NA
Grapes	83.58	77.73	10,404.0	9,675.72	92.0	8,901.66			13,448.95
Melons	15,725.0	6,919.0	48,841.0	21,490.04	32.20	6,919.80			4,933.34
Peaches & Nectarines	18,000.0	10,260.0	20,230.0	11,531.10	11.03	1,271.88			10,519.60
Pears	9,200.0	4,258.18	6,936.0	3,210.30			24.61	1,047.88	1,886.73
Plums & Prunes	936.23	1,664.24	4,335.0	7,705.90	78.41	6,042.20			1,021.73
Strawberries	11.33	10.31	4,913.0	4,474.11	99.77	4,463.80			1,983.87
Raspberries	12.97		NC						

COLORADO FOOD IMPORTS

COMMODITY	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
	Retail Weight (1,000 lbs.)	Retail Value (1,000 lbs.) (1981 lbs.)	Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of CO Consumption
Fruits, processed									
Frozen fruits	NC		8,005.3	13,384.86					
Frozen citrus juices	NA		28,611.0	40,787.84					
Canned & Chilled Fruit	NC		50,286.0	34,073.79					
Canned & Chilled Fruit Juices	NC		66,845.70	63,648.25					
Dried Fruits	NC		8,496.60	26,094.75					
Grains and Legumes									
Barley	74,419.34	38,636.02	3,468.0	1,800.59			95.34	36,835.43	1,112.0
Corn; flour, meal, creal, and starch [l]	140,116.03	105,446.72	45,662.0	34,363.72			67.41	71,083.0	13.234.0
Oats	2,964.3	2,060.78	8,959.0	6,228.30	66.91	4,167.36			5,656.0
Rye	1,344.0	484.43	2,023.0	729.17	33.56	244.71			1,416.0
Wheat; flour and cereal [k]	5,582,480.4	2,669,342.80	344,277.0	164,850.05			93.82	2,504,482.75	224,124.0
Dry edible beans	216,000.0	112,147.18	18,785.0	9,753.17			91.30	102,394.01	10,378.0
Dry field peas	2,381.15	1,236.30	1,156.0	600.20			51.45	636.10	803.0
Fats and Oils									
Lard	7,129.24	4,705.30	7,225.0	4,768.50	1.33		63.42		
Sweeteners									
Cane and Beet sugar	404,586.0	186,109.56	241,604.0	111,137.84			40.28	74,971.72	42,281.0
Honey	2,340.0	3,706.56	3,468.0	5,493.31	32.53	1,786.97			
TOTALS	10,140,598.43	6,709,417.7	3,464,218.10	3,191,400.36		1,069,124.09		4,936,925.21	

Colorado Food Imports Chart

Notes

a. Production data from Colorado Agricultural Statistics 1981, unless otherwise noted.

b. Consumption data from Food Consumption, Prices and Expenditures (Washington D.C.: GPO, 1981).

c. Acreage requirements from Steve Van Gorder, Rodale Research Center.

d. Dairy products acreage equivalents information from Mr. Carmen, USDA Dr. Crim, Colorado State University.

e. Estimates for fish production from Eddy Kochman, Colorado Division of Wildlife, Fisheries Department.

f. Pork acreage equivalents information from Dr. Wilson, Colorado State University.

g. Lamb acreage equivalents information from Dr. Swanson, Colorado State University.

h. Beef acreage equivalents information from Dr. Stanton and Dr. Lamm, Colorado State University.

i. Production weight given in terms of sauerkraut.

k. Wheat production from Colorado Grain Flow Survey Calendar Year 1981, M. Conklin and E. Moore.

l. Corn Production from Colorado Grain Flow Survey 1981.

ORGANIZATIONS INVOLVED IN FOOD AND AGRICULTURE

Consumers

Colorado Clearing House
4877 Packing House Road, Unit 112
Denver, CO 80216
(303) 825-2324

Colorado Cooperative Food Movement
c/o Betsey Flannagan
Boulder County Community Action Program
2006 Broadway, 3rd Floor
Boulder, CO 80302

Care & Share Program
J. J .Cook
Colorado Springs
(303) 634-2301
(Information on foodbanks in Colorado Springs and elsewhere)

Social Concern Cooperative Care Center
c/o Ascension Episcopal Church
420 West 18th Street
Pueblo, CO 81003
(303) 543-4253
(Emergency food assistance)

Master Gardeners Program
Cid Campbell, Director
P.O. Box 543
Fort Collins, CO 80522
(303) 221-7580

Sue Anderson
Department of Economics
AG. Clark Building
Colordo State University
Fort Collins, CO 80523
(303) 491-5706
(direct marketing information)

Producers

Colorado Farm Bureau
Dean Kittel
P.O. Box 5647 TA (80217)
Denver, CO 80217
(303) 455-4553

Colorado Greenhouse Growers
Association
Al Schmidt
Berthoud Rose Farm
Box 577
Berthoud, CO 80513
(303) 433-6423

Colorado National Farmers
Organization
George Davis
3978 West Road 9 North
Del Norte, CO 81132

Colorado Soil Conservation Board
Allen Campbell
618-A Centennial Building
1313 Sherman Street
Denver, CO 80203
(303) 866-3351

Colorado State Grange
Jean Davies
51 West 84th Avenue
Suite 230
Denver, CO 80221

Denver Agricultural & Livestock Club
James Dean
5995 South Syracuse
Suite 200
Englewood, CO 80111
(303) 694-0951

Farmers Marketing Association
Ernie Unrein
4545 Madison Street
Denver, CO 80216
(303) 893-8866

National Farmers Union
George Stone
12025 East 45th Avenue
Denver, CO 80251
(303) 371-1760

Rocky Mountain Farmers Union
John Stencel
4605 Paris Street, Box 39628
Denver, CO 80239
(303) 371-9090

Western Colorado Fruitgrowers Association
Bill Wyatt
c/o Bookcliff Orchard
688 27 ½ road
Grand Junction, CO 81501
(303) 242-2686

Women Involved in Farm Economics
Mary Carlson
Stoneham, CO 80754
(303) 735-2321

Food Industry

Rocky Mountain Food Dealers Association
1015 Kipling Road
Lakewood, CO 80215

Associated Grocers of Colorado
P.O. Box 5528 T.A.
Denver, CO 80217

Colorado/Wyoming Restaurant Association
1365 Logan Street
Denver, CO 80203
(303) 534-2972

Potato Administrative Committee
Mary Shields
2601 West 10th Street, Suite 3
Greeley, CO 80631
(303) 352-5231

Colorado Apple Administration Committee
Dan Schaefer
10755 West Iliff Avenue
Lakewood, CO 80227
(303) 988-3769

Colorado Beef Promotion Board
Gerald Plowman
34 Princeton Circle
Longmont, CO 80501
(303) 776-4248

Colorado Meat Dealers Association
Roger Gifford
789 Sherman Street #380
Denver, CO 80203
(303) 837-1280

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THE NEW HAMPSHIRE FOOD SYSTEM:
WORKING TOWARD SELF-RELIANCE

A Study of the New Hampshire Food System

by

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and

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Preface

Let me here make a few important comments about this study. Although this report does summarize the state of the New Hampshire food system and point out both general and specific areas in which we can make the system more stable, it does have its limitations. I strongly urge readers of this study to take these limitations into account when reading and relating the information in this report so that it can truly be a helpful tool in the stabilization of the New Hampshire food system.

1. This report shows that New Hampshire imports 63-72 percent of its total food. This percentage, however, does not reflect the actual percentage of imports, but our net imports. Very probably this estimate is too low. New Hampshire actually imports the same foods it exports, for example milk and produce; this is a function of the national marketing system. Earlier studies have estimated that New Hampshire imports 85 percent of its food; I do not interpret the results of this study to mean that New Hampshire imports significantly less food now than in the seventies, when these studies were done.

2. No one really knows what goes on in the New Hampshire food system. All figures are ultimately estimates; some are more accurate than others. Thus this study is an attempt to fit together the better-known parts to come up with a coherent picture. For example, there are no specific figures on food consumption levels in New Hampshire; national per capita averages are used. No one knows how accurate this is; it does not, however, take into account such differences as the tourist industry and the profound effects that has on what foods are consumed in New Hampshire. Also, no one really knows how much cropland is left in New Hampshire, or how much potential cropland is still available.

3. Production figures for each food item do not take into account home production and home storage, except for some meats. Admittedly, these are small amounts at this point, and probably would not significantly affect the overall percentage. However, home production and storage of foods may well be the area of greatest potential in developing food self-reliance. Therefore, it would make sense to monitor this aspect of the food system and create ways to increase this kind of production.

Introduction

The many miles of stone walls found rambling through the backwoods of New Hampshire remind us that once this was in fact an agricultural state. During the mid-to-late 1700's, much of the land which is now in immature forest was producing grains, vegetables, fruits and livestock; all things necessary to support the hundreds of self-sufficient farms across the state.

In the next century, starting in the 1830's, many New Hampshire farmers were drawn away from their farms, either to take up work in the factories and mills run by the multitude of swift streams and rivers in New England, or to travel west where richer land was there for the breaking. Those left soon began to specialize in dairy farming to provide the growing New England populations with fluid milk.[1]

In the years between 1910 and 1980, New Hampshire had more than doubled its population while retaining only one third of its cropland. Cropland was lost through both reafforestation and development. As nation-wide transportation became cheaper and faster, New Hampshire became almost completely dependent on those states which have had economic and environmental advantages in food production: California and the deep South for fruits and vegetables, the Midwest for grains and meat, and the Great Lakes states for milk and milk products.[2]

Today New Hampshire imports between 63 and 72 percent of its food. That percentage translates into about 380,000 tons of food imported per year. In 1981, an estimated $740,338,840 left New Hampshire to pay for these imports.[3] If that money had stayed within the state, it would have generated $1,628,745,400 in state and local business.[4] Since 5 percent of the retail value of food represents transportation costs, it cost around $37,016,942 to truck those imports to retail stores in New Hampshire.

Using current production systems and techniques, it would take 884,572 acres of cropland, excluding pastureland, to produce the food consumed in New Hampshire. In 1978 the estimated total cropland in New Hampshire was 136,000 acres,[5] a scant 15 percent of the necessary acreage.

Fortunately, the state of the food system has been an important concern in New Hampshire since the mid-seventies. Consequently, a large number of public and private organizations and state and university officials are working toward finding ways to make New Hampshire's food system more secure. And there are important indications that New Hampshire is, albeit slowly, developing a regionalized food and agriculture system, including a rise in the number of farms and the number of part-time farmers since the early 1970's, a greater use of direct marketing channels, and the emergence of some agricultural pioneers, including fruit and vegetable growers and even a cheese-maker.

New Hampshire is far from being food self-sufficient. And considering current rates of population growth and the amount of land available, it probably never will be. But New Hampshire could be, and indeed must be, a great deal more self-reliant. We are moving in that direction, but it will take a greater effort and awareness on the part of consumers, business people, producers, and state and local officials before we can feel more secure about where our food is coming from. In New Hampshire, we need to attack the problem from a number of fronts. It is clear that we need to produce more of our own food and become less dependent on the national food pipeline. But to do that we also need to become responsible consumers. We need to change the foods we eat and orient our diets around the seasons and what can be produced and stored in New Hampshire. We need to support local producers by patronizing direct marketing outlets even more than we do now. We need to become individually responsible for our food supply by producing at least a part of our food ourselves. No commercial operation can match the yields of a well-tended garden, nor provide fresher, healthier meat, eggs, and milk than home-raised livestock.

Imports/Exports

New Hampshire's imports and exports immediately point out areas in which the food system could be strengthened. New Hampshire produces about 6 percent of its meat, fish, poultry, and eggs. Currently these are produced in a large part using imported grains. If we expanded and improved our pastureland and switched to meat-producing systems which are based on grazing rather than grain-fattening, we could potentially produce more of our own meat. New Hampshire's dairy industry exports fluid milk, but since there are no in-state processing plants, all milk leaves the state for processing and packaging before it is sold in New Hampshire stores. Some New Hampshire milk is made into ice cream, but we import virtually all of the other dairy products, including butter. A more locally-based dairy industry, including a number of small processing plants, could make us more secure in this area.

Although New Hampshire exports around 15,000 tons of apples per year, as well as a small amount of soft fruits and vegetables, including 46,000 tons of potatoes, it imports most of its fresh fruits and vegetables and virtually all of its processed fruits and vegetables. The chart figures are somewhat misleading here. For example, they show that New Hampshire exports asparagus. This is true; however, it exports a great deal of it during a certain portion of the season, and imports it, both fresh and processed, during the rest of the year. This is true for other items as well. New Hampshire exports potatoes, but imports other varieties that aren't grown in New Hampshire. The same is true for apples; we export MacIntosh but import Delicious, Cortlands, Granny Smiths, etc. Thus the estimate that New Hampshire imports 63 to 72 percent of its food is a low estimate; likewise the export estimates are probably low. The marketing system is such that food that is raised in New Hampshire, regardless of whether the state imports or exports that food item, is not necessarily consumed in New Hampshire.

There is great potential in the area of fruits and vegetables to improve our food import/export ratio. A great amount of land in New Hamsphire is well suited to growing vegetables and soft fruits.[6] And if done on a small scale, with proper management, vegetable growing could produce very high yields. One of the biggest obstacles here is the current marketing system; small-scale regional fruit and vegetable production would arise only if there was an extensive, stable, direct marketing system. Also, New Hamsphire needs processing plants so that we can store the fruits and vegetables we do raise, instead of importing all processed fruits and vegetables.

And, although it is quite possible to grow grains and legumes in New Hampshire (see, "Small Grains," UVM crop report; New England Farmer, June 1982; and Soybean Production in New Hampshire, UNH INER Research Report #75, 1979), New Hampshire imports all its grains, including feed grain, and legumes. We import almost all our fats and oils, but export maple syrup.

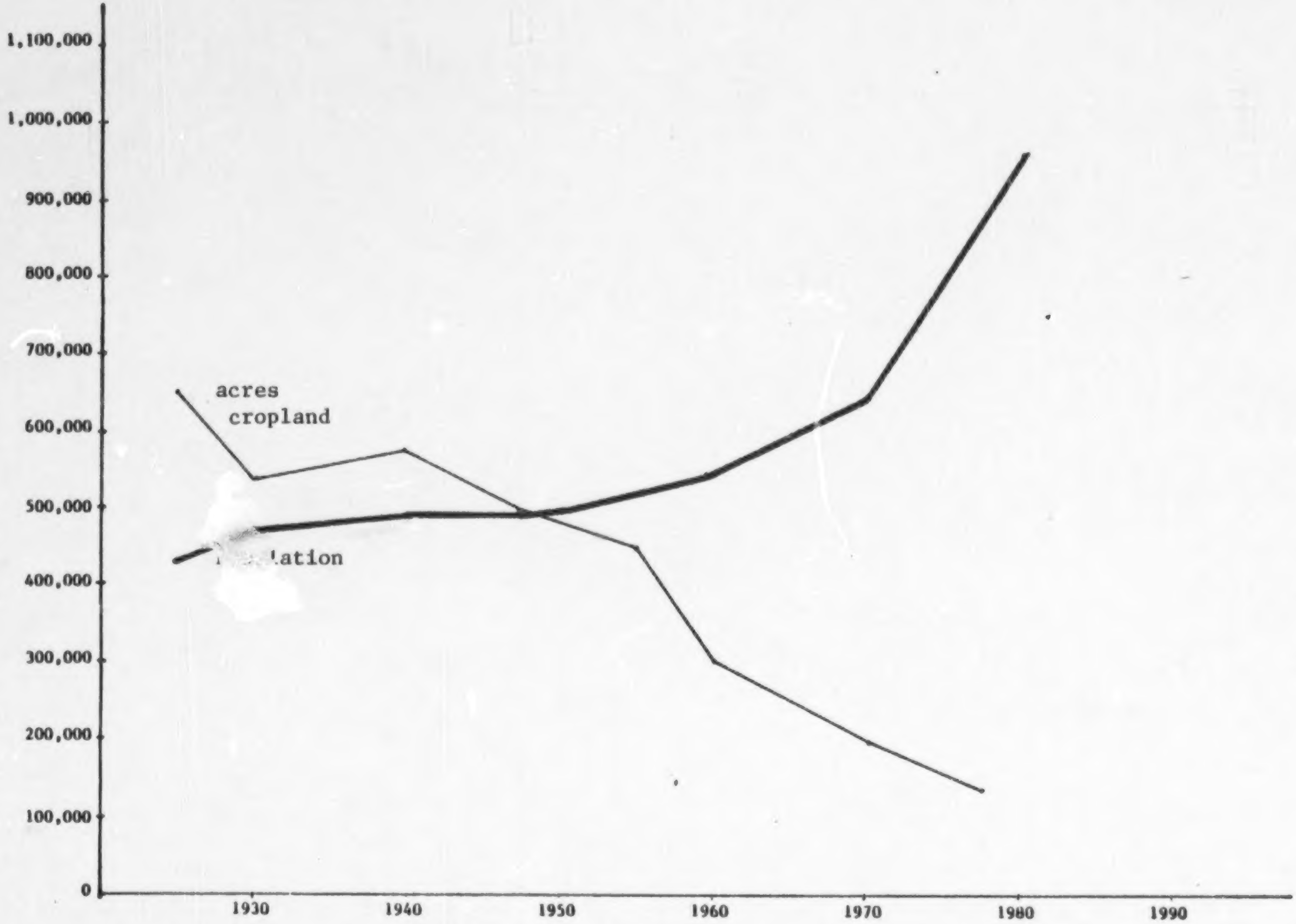
Of course, what New Hampshire produces not only depends on available resources but also on economics. In general, meats and grains can still be produced and shipped to New Hampshire at a cheaper price than if they were produced in New Hampshire. This used to be true of fruits and vegetables from the South and Southwest, although it is questionable whether it still holds today. However, what is not economical today may be economical tomorrow. As production and transportation costs rise over the entire country, and we pay more and more money for our food, we may find it profitable and beneficial to produce once more things which haven't been produced in New Hampshire in decades.

Land and People

Figure 1, "Population vs. Available Cropland in New Hampshire, 1930-1980," shows clearly the trend that as our population soars, we lose more and more of our cropland.

New Hampshire is the fastest growing state in New England, the second fastest east of the Mississippi, and the eleventh fastest in the nation.[7] From 1900 to 1950 New Hampshire's population grew at 5 percent per year, which was half the New England rate and one third

Figure 1 Population vs. Available Cropland in New Hampshire, 1930 - 1980



Source: Recommendations for a New Hampshire Food Policy.

the national rate. The population grew tremendously in the years between 1950 and 1979, from 53,000 people to 877,000. Since 1960, while the national growth rate averaged 1.14 percent, New Hampshire's population grew 2.3 percent per year.[8] However, the entire state did not grow at the same rate. Sixty percent of this increase occurred in the southern section in Hillsborough and Rockingham counties, where much of New Hampshire's best farmland lies. The Lakes region showed moderate growth, but the north country grew slowly.[9]

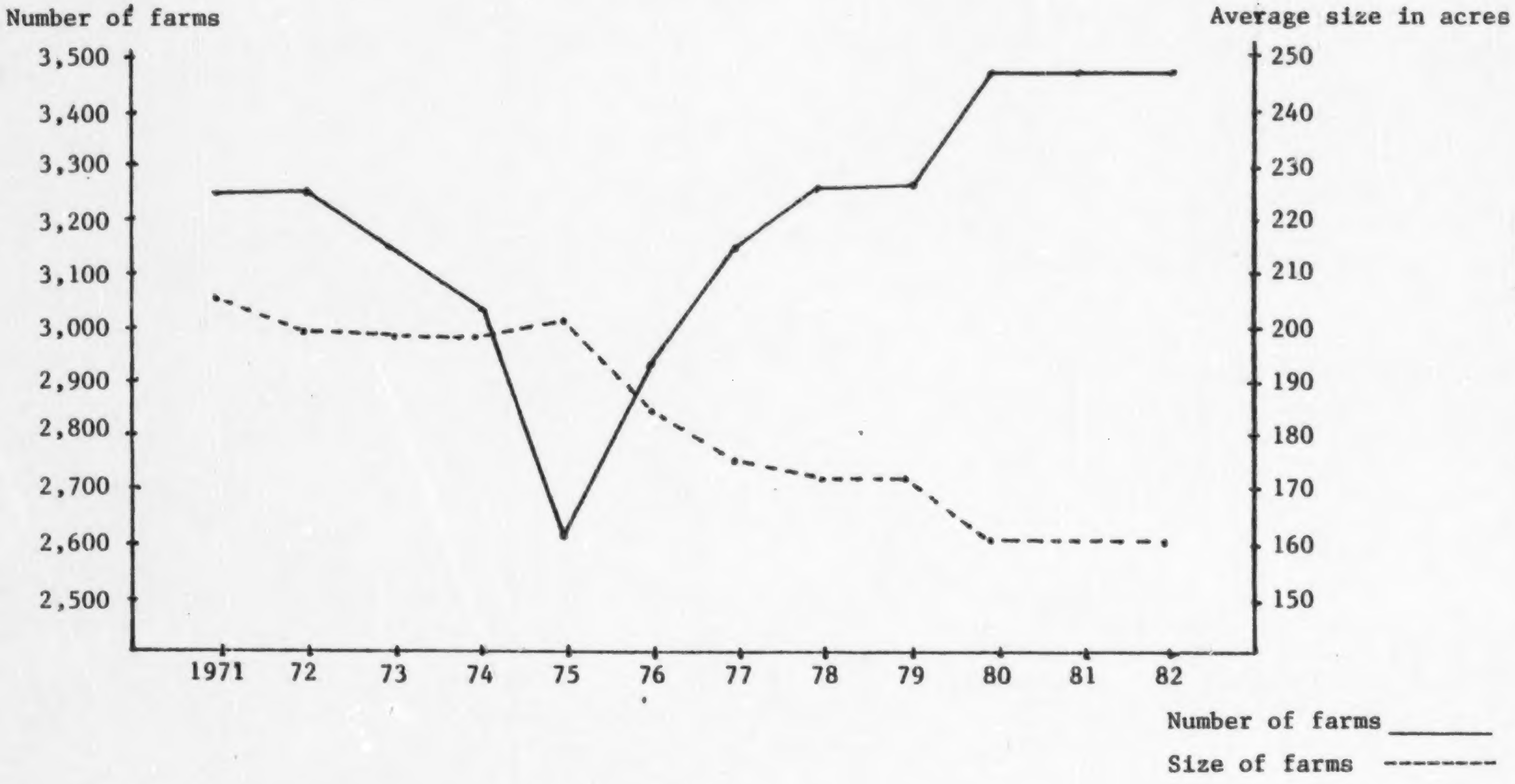
As the population grew and New Hampshire changed from an agricultural state to an industry and tourist state, cropland was lost through reafforestation and development. It is estimated that between 1949 and 1974, New Hampshire lost 68.5 percent of its farmland and 61.4 percent of its total cropland.[10] The years between 1964 and 1974 showed a 40.2 percent drop in farmland; and another 11.2 percent was lost between 1969 and 1974.[11] Certain areas of the state lost more farmland than others. During the 1950's when the greatest land use changes occurred, 8 percent of the total land in agriculture was developed while 18 percent became idle, or began the process of reafforestation and can potentially be returned to agricultural purposes.[12] Carroll County and the Connecticut River counties of Cheshire, Coos, Grafton and Sullivan lost less than 7 percent of the Best to Good agricultural land to development, whereas Hillsborough and Rockingham lost 16-19 percent.[13] Total developed land in the 1970's was two and a half times that of the 1950's and now represents about 4 percent of the total state.[14]

Figure 2, "Farm Number vs. Farm Size, New Hampshire, 1971-1982," shows that as average farm size has decreased, the number of farms has increased. Contrary to national trends, the trend in New Hampshire is toward a greater number of smaller farms. A recent USDA report concluded that the number of small farms in the northeast region will continue to increase by about 8 to 10 percent through 1990.[15]

Soil surveys of New Hampshire show that there is a large amount of prime farmland in all areas except for the far north and the White Mountain areas. These farmland soils are capable of producing a variety of crops including corn, vegetables, small fruits, hay and pasture, alfalfa, and tree fruits. Intensive management practices would make these soils even more productive than usual management practices.[16]

Generally speaking, soil erosion does not seem to be a great problem in New Hampshire, although certain areas, especially on the prime lands on river floodplains, continue to require careful management. Current erosion rates on New Hampshire cropland are estimated to be 3.5 tons of topsoil moved (but not necessarily lost) per acre per year; the acceptable rate is 5 tons per acre per year.[17]

Figure 2 Farm Number vs. Farm Size, New Hampshire, 1971 - 1982



Source: New England Crop and Livestock Reporting Service

Farming Expenses

It is not easy to make a living farming in New Hampshire; it is even harder to get started in farming. The obstacles and barriers in farming include the high costs of land, equipment, fuel and fertilizers, high taxes, and a marketing system that favors the large distant producer over the smaller local producer. As of January 1, 1982, the total New Hampshire farm debt, including farm households, was 88.7 million dollars, which represents 91 percent of the total cash receipts from farm marketings in 1981. In other words, New Hampshire farmers owe almost as much as their total gross income. Sixty three percent of the total debt is real estate debt; 36 percent is non real estate debt, excluding CCC.[18] In 1979, the most recent year for which complete statistics are available, the gross farm income in New Hampshire was 114.9 million dollars. Production expenses, including feed, livestock, seed, fertilizer and lime, repairs and operation of equipment, hired labor, depreciation, taxes, interest on debts, and rented land, totalled 104.8 million dollars, 91 percent of the gross income. The average net farm income in 1979 was $3,687.[19] Among the most expensive production costs are feed, fertilizer and chemicals, fuel and taxes. In 1979 the average New Hampshire farmer paid out $7795 for feed, $4207 for fertilizer, lime and other agricultural chemicals, and $2914 for fuels and energy.[20] That farmer also paid $8.48 per acre in taxes, which is a 142 percent increase since 1967.[21]

As long as we produce the foods we produce using the techniques and energy we use, we will continue to be heavily dependent on outside inputs of feed, fuel, and fertilizer and other chemicals. We will need radical changes in our production systems and consumption patterns to reduce these dependencies. We can, however, alleviate some of the burden on farmers of the cost of production by restructuring our tax system so that farmers pay a smaller share of state taxes.

Energy

The world energy situation and the subsequent increase in energy prices have drawn virtually everyone's attention to the problem of energy. New England derives most of its energy from oil; oil prices are substantially higher (approximately 17 percent) in New England than other parts of the country since we are at the end of the energy supply-line. A significant portion of our energy dollars go to agricultural production and transportation in New Hampshire.

This century has brought mechanization to New Hampshire agriculture; instead of relying primarily on human and animal labor, we now rely on nonrenewable fuels such as gasoline, diesel fuel, bottled gas, fuel oil, and electricity to power our machinery, heat and light our barns, transport and cool our products, and handle feed and wastes. In 1978 New Hamsphire used a total of 1080 billion BTUs in agriculture;

846 billion BTUs were used to produce and transport crops, and 234 billion BTUs were used in raising and transporting livestock.[22] This includes the energy required to manufacture fertilizers and pesticides; the manufacture of these chemicals accounts for 32 percent of the total, or 347 billion BTUs.[23] In 1978 New Hampshire used 3,202,000 gallons of fuel oil, 342,000 gallons of bottled gas and 18 million kilowatt hours of electricity.[24]

The greater costs of these fuels in New Hampshire increases the cost of food production within the state, making it harder for in-state producers to compete with out-of-state producers. A large percentage of these energy costs are for transporting products. By restructuring the marketing system so that it is based on local production and local consumption, we can alleviate some of these costs.

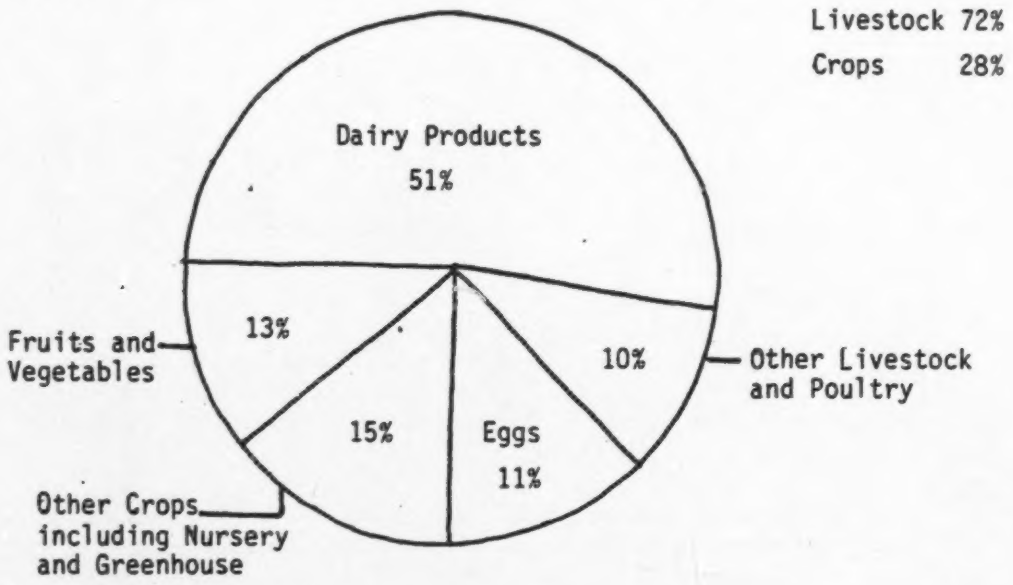
Since 32 percent of the energy used in New Hampshire goes to producing chemical fertilizers and pesticides, we could cut agricultural energy bills by converting to organic farming methods. In 1981, New Hampshire farmers used 24,650 tons of fertilizers, which are becoming very expensive as energy costs rise.[25] Organic methods which would eliminate or at least greatly reduce chemical fertilizer and pesticide applications include crop rotation with legumes, green manuring, and sheet composting for building natural soil fertility, and using integrated pest management (IPM), intercropping, crop rotations, and diversified production for natural pest and disease control.

New Hampshire farmers are moving slowly toward these methods. Fertilizer use is diminishing a few percentage points each year (1981 use was 93 percent of 1979 use[26]), although this may just be a result of lower production. Most of the manure from New Hampshire livestock is returned to fields. The extension service and the conservation service have implemented outreach and educational programs to develop the use of minimum tillage and IPM techniques on New Hampshire farms. Farmers have shown a great deal of interest in learning about minimum tillage; a limitation now is lack of available appropriate equipment. Alan Eaton, the IPM coordinator at UNH, reports that the extension IPM program has thus far been a success. Outreach is conducted through a weekly newsletter, "New Hampshire Insect Notes," and a Code-a-Phone for fruit pest updates. IPM plots of fruits and vegetables have proven very successful. Conventional apple orchards had nearly twice as many fruits with insect or disease injury as the IPM plots.[27] The costs of implementing IPM techniques were lower than the usual chemical methods of pest management. Similar successes in lower costs and comparable or higher quality produce were made in blueberries, potatoes, and sweet corn.

Agricultural Industries

Although New Hampshire is no longer an "agricultural" state, agriculture is still an economically important industry in the state. In 1981, the total cash receipts from farm marketings were $97,216,000.[28] This is up slightly from 1979. Figure 3 shows how much of the total cash receipts each industry represents.

Figure 3



a. Dairy and Beef

Dairying is the largest segment of New Hampshire agriculture; beef production is inextricably intertwined with the production of milk. The number of beef cattle in New Hampshire is less than one tenth of the number of dairy cattle, however. Between 1969 and 1973 New Hampshire lost an average of 52 dairy farms per year. The total number of herds and the total number of cows declined while average herd size increased; it was the farmer with the smaller herd who was squeezed out during this time.[29]

Although all feed grain is imported into New Hampshire, dairying and beef production are still vertically integrated on New Hampshire farms. This means that except for grain, all feed including pasture and forage is raised on the farm where it is fed to the livestock.

An important by-product of the livestock industry is manure. Of the 595,000 tons of manure produced yearly, 500,000 are returned to the soil.[30]

Of the milk produced in New Hampshire, a small percentage is fed to calves, and a small percentage is marketed directly. Ninety-four percent is converted to beverage milk, while about 6 percent is converted to frozen dairy products and frozen dairy mixes. Virtually no New Hampshire milk goes into producing butter or cheese.[31] Since there are no milk processing plants in New Hampshire, all raw milk is trucked out of state and equivalent milk is brought in wholesale to supply wholesale and retail channels in New Hampshire.

There are not nearly enough meat animals raised in New Hampshire to fill the capacity of in-state slaughter and packing houses. Almost 83 million pounds of dressed weight meat are processed in New Hampshire; almost 50 million pounds are shipped out of state. About half of the rest is sold to hotels, restaurants, and other institutions; the balance of 17 million pounds moves through regular marketing channels.[32]

According to "Resources and Technology on New Hampshire Dairy Farms," by R. A. Andrews and T. C. Stein, the current use valuation tax program, which taxes agricultural land at a lower rate than residential and commercial land, will play an important part in dairy prospects, since taxes are a significant portion of production costs. In 1976, Fifty five percent of the 256 dairymen in New Hampshire were involved in this program.[33]

The current structure of the dairy and beef industry clearly points to several ways in which we could make our food system more stable. It is encouraging that by and large dairying is a vertically integrated production industry, thus it would be easier to convert from regional production and marketing to localized production and marketing. A young farming couple in Greenville, New Hampshire, provides an example of this and shows us that there is a great potential in local production, processing and marketing. This couple has recently started to produce semi-hard cheese, produced from milk from their small herd, for local sale. Their operation has thus far been successful; they are currently considering increasing their production.[34] It is clear that to stabilize the dairy portion of our food system we need small local processing plants so that milk can be marketed and consumed close to where and when it is produced. And since dairying and meat production are dependent on grain imports, we might look into the possibilities of growing our own feed grains, developing an appropriate feed grain substitute (for example, certain trees, including locusts, chestnuts, oaks, beech, etc. produce nuts and seeds that potentially can be developed into stock feed and can be grown on hilly land not suitable for other crops), and finding production methods which aren't based on grain feeding and fattening. The latter is particularly applicable to beef production; although it takes longer and produces a product slightly different in taste and texture, beef cattle can be raised on grass and forage without grain, providing the leaner beef many consumers today are demanding.

b. Pork and Lamb

Although sheep raising is still a small part of New Hampshire's agriculture, it is a stable segment. This stability is probably due to the fact that there are a large number of small herds; this represents many part-time and home-production operations. Two thirds of the annual lamb crop is custom slaughtered. Approximately 60 percent of the lamb crop is exported hothouse or Easter lamb, which commands a high price at the market.[35]

Pork production has declined steadily in New Hampshire. Virtually all the pork produced is for home consumption; 90 percent is custom slaughtered. One third of the annual production of pigs is exported as feeders or replacements and the remaining two thirds are raised locally for home slaughter.[36]

For both sheep and swine raising, feed costs and payments to meat processors are significant. However, "...both of these animal enterprises make moderate contributions to the New Hampshire market economy but make substantial contributions to the welfare of individual consumers either in reducing the cost of their food or in improving the quality of their diet."[37]

c. Poultry and Eggs

At one time the poultry and egg industries were very important to New Hampshire agriculture. "Prior to 1955, the New Hampshire broiler and egg industries were growth industries. The broiler industry peaked in 1956, egg production in 1964, after which the industries entered periods of decline. By 1973, broiler production had declined to a negligible amount and the egg industry tended toward stabilization."[38] These industries declined in a large part due to modernization of production technologies and shifts in the market structure which favored the larger and more specialized operations in other parts of the country over the smaller New Hampshire producers.[39] Since 1950, egg production and the number of layers has dropped 60-70 percent. In 1980, several large laying operations went bankrupt, two expanded and one shifted to a breeder operation. The net change in the number of birds was a 34 percent reduction in the number of layers, a 16 percent decrease in the number of pullets, and a 12 percent increase in the number of breeders.[40] Fifty-seven percent of the eggs produced in New Hampshire are sold wholesale; 40 percent are sold to stores and restaurants.[41]

Although virtually all poultry feed grain is imported, New Hampshire has demonstrated that it can produce chickens and eggs. Changes in the marketing structure which would favor smaller local producers and local marketing and distribution of chicken and eggs might stimulate the poultry industry and make our supplies more stable.

d. Fruits and Vegetables

Fruit and vegetable production in New Hampshire is generally governed by what one extension agent called an "underground economy." Since it is difficult for the small New Hampshire grower to successfully compete in the commercial wholesale marketing structure, much of what is grown is for direct marketing and home consumption. New Hampshire has the potential to grow much more of its fruits and vegetables; it is the restrictions of the commercial marketing system and the limitations of current direct marketing channels which, to a large degree, cause this under-production in New Hampshire. The UNH report, "Marketing Agricultural Products in New Hampshire: VII. Vegetable Market Structure and Expansion Potential" by Andrews, Leighton and Latremore, shows that in 1977 an estimated 1100 acres were readily available for vegetable production.[42] Under intensive management, this land could produce an enormous amount of fresh fruits and vegetables; smaller plots of land can be utilized in home gardening, producing even more fruits and vegetables.

In 1981, the New Hampshire Department of Agriculture reported that the New Hampshire vegetable industry represented a $10 million value and that 4600 acres were in commercial production.[43] This represents about 5.5 percent of the total agricultural cash receipts paid to farmers.[44] Vegetable production is increasing slowly, except for potato production, which has decreased rapidly in the past 15 years.[45]

There is a steady increase in soft fruit production as well, such as strawberries, blueberries and raspberries. Soft fruit production is valued at $3.5 million. However, New Hampshire's main fruit production is apples. The 5000 acres of New Hampshire apple orchards, mostly MacIntosh, produced 1.5 million bushels of apples in 1980, valued at $11 million.[46] Apples represent 7.6 percent of our agricultural economy in terms of growers' cash receipts.[47] Nursery and greenhouse products are another very important agricultural industry; in 1979 these represented 9.4 percent of the total cash receipts.[48]

Although it is extremely difficult to estimate the amount of fruits and vegetables produced in home gardens in New Hampshire, the results of the recent national Gardens for All survey can give us an estimate based on averages from the East. According to this survey, 41 percent of the people in the East garden; the median garden size is 660 square feet, and produces 545 lbs. of food per season. According to these averages, New hampshire residents cultivate 249,117,000 square feet of gardens and produce 205,710,250 pounds of fresh fruits and vegetables.[49]

New Hampshire is seriously hampered by a lack of produce processing plants and storage facilities. It is estimated that New Hampshire has only a 5-10 day reserve of food; if we suffered an oil embargo or and across-the-board truckers' strike, cutting off supplies, retail stores would run out of food after about a week.[50] New Hampshire has only two food processing plants other than fish processing and packaging plants, and has no large storage facilities. In order to develop any kind of food self-reliance we need plants to process and package our commercially produced fruits and vegetables, and we need facilities for storing large amounts of storable fresh vegetables such as potatoes, onions, beets, squash, and cabbage. We also need to make greater use of the home storage techniques such as root-cellaring, canning, and freezing in order to preserve the harvests of our home gardens.

e. Fisheries

New Hampshire fishermen make good use of the 17 miles of New Hampshire coastline. In 1981 New Hampshire fisheries harvested 6,693,515 pounds of fish, a $2,329,000 value, of cod, pollock, haddock, flounder and scallops.[51] Commercial operations and individuals trapped 691,667 pounds of lobster.[52] The 16 processing and wholesale plants in New Hampshire provide year-round employment for 477 people.[53]

Conclusion

New Hampshire currently produces small quantities of many of the foods we consume, and the potential to expand this production exists. In order to develop a more stable and sustainable food system, we need to alter our current methods of production and distribution. We must learn to use our resources to everyone's advantage. We need to strengthen direct marketing channels that best serve New Hampshire's growing number of small farms. We should grow more food at home, and learn how to keep the harvest through the winter. We need to limit our use of expensive, imported energy. Many people in New Hampshire have already started work in these areas. By joining and supporting them, we are assuring ourselves of a stable, sustainable, and vital food system.

Direct Marketing of Produce in New Hampshire

One of the most important ways New Hampshire could be more self-reliant in food is by producing more of our own produce and supplying our own markets. One of the biggest ways to encourage greater production of fruits and vegetables is to favor the small-scale New Hampshire grower by increasing and strengthening direct marketing channels. Although at this point the expansion of large-scale vegetable production in New Hampshire is limited by available cropland,[54] there is a great potential for small-scale, part-time growers if markets exist in which they can get a fair price for their produce.

Although the structure of the produce marketing system in New England is slowly changing, it still very much favors the large-scale growers of the South and Southwest over the smaller, seasonal regional growers. The center of distribution for produce in New England is the Boston Terminal Market in Chelsea, Massachusetts. To this market come trucks and railcars of produce from California, Florida, Idaho, Oregon, the Carolinas, Mexico, New Mexico, Texas, etc. The produce which goes through Chelsea market is mostly from large commercial operations, and market brokers prefer purchasing from these operations because of better prices, uniform quality, and scheduled deliveries.[55] In this system, based on regular large volumes handled by a few operators, small producers have a very difficult time competing. Since buyers need a year-round supply of most commodities and out-of-state producers need year-round markets, brokers and large-scale producers are almost inextricably linked in the national and international production networks. Growers from New England, all of whom are small-scale compared to southern and western growers, usually have produce to sell only at certain times in the season. By bringing in-season produce to the market, they create a glut; it becomes a buyer's market, prices are depressed and the small producer is hardest hit. Many small producers are also unaware of or not able to meet the quality standards of packing, grading, washing, and cooling required by the buyer, which puts them at a further disadvantage.[56]

Small producers across the nation have always complained of a lack of access to markets. This lack of access effectively bars small producers from significantly contributing to the national food supply. "Small growers could supply a large part of the fruit and vegetable requirements when in season. This is particularly true for fruits and vegetables that require hand harvesting,"[57] concludes the TVA report, "Marketing Alternatives for Small Farmers." It is clear that small producers cannot as individuals effectively compete within the national marketing networks. As the TVA report states, "...we are in the midst of a realignment of traditional marketing channels that will result in a significant difference in the way food is distributed... food retailing is experiencing an upheaval. Some supermarkets are profitable, but others are bankrupt... the fast food houses and conventional restaurants have enjoyed great successes in the past decade, but their expansion seems to be slackening... This is the environment direct marketers find themselves in today... the potential for a significant and profitable share in the food markets."[58] Certainly facilitating direct producer-consumer links will be beneficial to both parties. Consumers would pay lower prices while farmers would receive a higher price per pound for their produce, since distribution and transportation costs are effectively eliminated. Produce would be fresher, and farmers would have direct contact with consumers, and therefore have a better idea of consumers' needs.

Implementing direct marketing channels in New Hampshire has been harder than expected. It is not easy to compete with the existing market networks, which are well established. Nor is it easy to coordinate growers to produce uniformly packed, graded, washed, and pre-cooled fruits and vegetables. Most importantly, it is hard to re-educate consumers who for years have been used to perfect, uniform produce, and a large selection of varieties, no matter the season. It is consumers' demands for the entire range of produce items year-round which necessitate out-of-state control of New England markets and essentially keep local growers from competing.

Direct marketing alternatives can be divided into two groups: wholesale market alternatives and direct farm-to-consumer alternatives. Wholesale alternatives include pooling arrangements such as growers' cooperatives, and store-to-door sales where farmers sell directly to retail stores. Direct farm-to-consumer alternatives include roadside stands, pick-your-own operations, and farmers' markets.

The direct marketing method that probably shows the most potential for big success and yet has proved the most problematic is producer coops. Problems include a lack of sufficient start-up funds, problems in management and access to appropriated markets. Also, growers often are unwilling to completely relinquish their rights to bargain as individuals for the good of the coop. New Hampshire has one operating coop, the Merrimack Growers Coop in Concord, and one coop in the initial organizational phase, the Seacoast Growers Association, in Stratham.

Store-to-door sales are a possible market open to New Hampshire growers. A study by the Connecticut River Valley Agricultural Project, a cooperative project of New Hampshire and Vermont's Department of Agriculture and State Planning Offices, showed that most retail groceries in that area are buying some produce from local growers.[59] Selling produce through a roadside stand has been a traditional market for New England growers, and roadside stand sales have risen in the past few years.[60] Pick-your-own operations, producing items which require frequent hand-picking such as berries, apples, grapes, peas, beans, and sweet corn, etc. have also enjoyed growing successes.

Farmers' markets are staging a comeback in New Hampshire. In 1981 there were 15 farmers' markets, in 1982 there were 20. Although farmers' markets are time-consuming for growers, the prices they receive for their fruits and vegetables are usually high enough to make it worthwhile.

Direct marketing outlets can be greatly aided by state and local support, but it is the producers and the consumers who ultimately must develop this new marketing system. Producers need to work together for a common goal rather than try to make it as individuals. There needs to be more cooperation among producers in growers' coops and in farmers' markets. They need to be more aware of consumers' needs and also of buyers' needs in grading, packaging, washing and cooling, and be willing to respond to these needs. Consumers, including buyers in restaurants, hotels and institutions, need to make a real effort to support direct marketing outlets by buying and eating much more locally grown produce. They should eat more seasonally, not demanding lettuce and fresh tomatoes in January, and buying produce during the harvest-time and canning, freezing, and root-cellaring as much as possible.

What's Being Done

The state of the New Hampshire food system has been a concern of consumers, farmers, food wholesalers and retailers, state and university officials, and concerned citizens for a number of years. In May, 1979, Maynard Heckel, director of the Cooperative Extension Service at UNH, wrote, "There is a quiet, but widespread, concern among the citizens of our state about the future availability of food at a price we can afford to pay, and at a price that is adequate to assure producers a fair return on their investment. This concern started to gain momentum in 1973 with the oil embargo and has increased with severe weather conditions, increased cost for fuel to transport food into the state and the shift in the use of good farmland from food production to other uses."[61] Citizens have not only voiced their concerns, they have begun to organize and work to change the present situation. Not only are state and university officials supporting local agriculture and food self-reliance in their work, but consumers and producers are working together to open direct marketing channels, educate the public, lobby state government, and learn more about ways to strengthen the food system. These efforts are slowly being rewarded; people are beginning to take responsibility for their own food, more and more people are getting started in food production, whether on a full or part-time farming or a gardening scale, and are finding the resources available to help them. People are beginning to give support to local producers, buying more food from roadside stands, and farmers' markets. And people are taking the responsibilty to educate themselves about their food system and food-related issues. There remains much to do, but we have made an honest beginning.

Although many are disappointed at the lack of support shown by the state legislature (e.g. the Sunset Review report which recommends abolishing the New Hampshire Department of Agriculture,[62]) and the lack of follow-up funds for the successful Purchasing Development Rights Act,(an act which allows the state to help protect our dwindling farmland acreage[63]) state offices and state and university programs have lately emphasized and supported local agriculture and stabilizing the New Hampshire food system. The New Hampshire Department of Agriculture, aside from their information-gathering and organizational work, has done a great deal of work promoting local agriculture. Through their "Nature-ly New Hampshire" campaign and their support of efforts in direct marketing, they have worked to educate consumers and producers about the economic, ecologic, and health benefits of strong local agriculture. The Department of Agriculture is currently under seige in the wake of the Sunset Report recommendations; it would be extremely unfortunate if current economic hardships within the state government were dealt with by eliminating or reducing this most necessary and beneficial state department.

The various agricultural groups in and around Durham, New Hampshire, UNH, Soil Conservation Service, Cooperative Extension Service, and the Department of Agriculture, all emphasize the development of a sustainable local food system and careful conservation of available resources. A number of UNH students have researched ways to make New Hampshire more self-reliant, and UNH regularly publishes reports on such helpful topics as direct marketing, the structure of different agricultural industries, land use patterns, soil surveys, etc. in their efforts to gather and organize basic information on New Hampshire agriculture. The New Hampshire Cooperative Extension Service recently published a booklet for the public, "And When We Went There The Cupboard Was...Bare," which outlines the instabilities of the New Hampshire food system and suggests ways in which people can help in the development of a stable system. The Extension Service also has a great deal of contact with New Hampshire producers, and helps them obtain the information and technical assistance they need.

There are a number of state and local citizens' organizations in New Hampshire whose goals are to help develop a sustainable food system. This may be through education of each other and the public, developing and sharing practical skills, establishing growers' coops or farmers' markets, lobbying the state legislature, etc. Although it is impossible to mention them all, a few are most noteworthy.

The Natural Organic Farmers Association (NOFA) which began in 1971 from a meeting of growers in Vermont interested in finding ways to market organic produce, has become "...a focus for farmers and non-farmers alike who believe that environmental health, viable communities, meaningful work, and a sound local economic base can flourish with the development of a diversified regional agriculture which works within the natural rhythms of the Earth."[64] Until last year NOFA was split into two cooperating chapters, New Hampshire and Vermont; recently chapters have formed in other northeastern states. NOFA supports small-scale and organic farming through its newsletter, The Natural Farmer, workshops, apprenticeships, seminars, on-farm research, and its very popular annual conference. Many first-time farmers and gardeners in New Hampshire gained the knowledge and skills necessary to grow food from NOFA. NOFA provides support for people who are continuing their efforts to develop local sustainable agriculture.

NOFA has also supported the development of direct marketing channels. In 1979, the New Hampshire NOFA chapter organized the Central New Hampshire Agricultural Marketing Project in Concord, specifically for that purpose.[65] The primary goal of CNHAMP is to establish local marketing structures for central New Hampshire farmers. Thus far, CNHAMP has organized the Concord Farmers' Market, and the Merrimack Growers Coop, the first vegetable coop in New Hampshire (the Seacoast Growers Association in Stratham, New Hampshire, is in its organizational phase). Current CNHAMP projects include establishing the Mobile Farmers'

Market, which travels to low-income and elderly housing projects, organizing a federation of New Hampshire farmers' markets, and developing local markets for storage crops.

The Rural Education Center (TREC), in Wilton, directed by Samuel Kaymen, is an educational center dedicated to the development of sustainable agriculture and a stable food system. "The goal of the Rural Education Center is the development of a land-based culture in which people, communities, and regions are self-sufficient in food, fiber and fuel. Focusing on New England, TREC provides an opportunity for people to acquire practical training and experience in rural skills as well as knowledge of the principles necessary for the creation of a sustainable agriculture. The Center's programs promote self-reliant living, cooperative work styles, careful use of the land, and management of local resources to meet the basic human needs of the region."[66] The center is currently involved in establishing a yogurt factory, as an example of ways that farmers can diversify, process and market their own products locally.

Recently a group has formed in the Dover area called the Friends of Agriculture. This group is working to support agriculture in their area by supporting the Rochester and Dover farmers' markets, conducting an agricultural inventory of Dover, developing a local promotional campaign, including a series of newspaper articles and radio programs on agriculture, and continuing their coordination of bulk fruit tree orders.[67]

The New Hampshire Farm Bureau, an older organization of established farmers, shows its support by carrying on the often difficult job of lobbying the state legislature and keeping tabs on its actions. The Farm Bureau also coordinated direct-marketing of food within its member group.[68]

Four years ago a coalition of 17 organizations, including representatives from citizens groups, state offices, the university, state legislature, extension service, businesses, etc, met and discussed issues surrounding the security of the New Hampshire food system. The outcome of this meeting was a booklet, "Recommendations for a New Hampshire Food Policy,"[69] which documented the long-range goals in consumer needs, land use, agricultural production, marketing, transportation, and food storage and processing, developed by the group. These recommendations are still very sound; this document is probably the most important step towards food self-reliance yet taken in New Hampshire. The ground is broken; we now know what we need to do to develop a stable food system, and we even know much about ways to do it. Our task at this point is applying our knowledge and experience. Many people have begun, but ultimately everyone will need to get involved.

RECOMMENDATIONS

When the New Hampshire Food Policy Study Committee met four years ago, they developed specific recommendations based on the input from representatives of all areas of the New Hampshire food and agriculture system. These recommendations are still very appropriate and comprehensive. Therefore, instead of reproducing a new set of recommendations, I have used their recommendations as found in "Recommendations for a New Hampshire Food Policy" as the core of my recommendations. I have updated a few recommendations, added words here and there, and added points of my own. Any changes or additions I have made are in parentheses.

The immediate goal of the Policy Committee was to form recommendations as a foundation for a comprehensive food policy. To instate this policy and make it effective, concluded the committee, is the challenge which faces New Hampshire residents today; this is especially true in the wake of state and local governmental budget cuts,which have reduced the capacities of many government offices. "A decision should be made on a state food policy. In order to accurately reflect the needs and goals of New Hampshire's citizens, this decision must be made by people themselves based on an informed study of each element of the question. The report of the New Hampshire Food Policy Study Committee, "Recommendations for a New Hampshire Food Policy", should serve as the source of the decision as to whether or not to implement a comprehensive food policy. The ultimate decision rests with New Hampshire's people."70

CONSUMER NEEDS (AND RESPONSIBILITIES)

GOAL: Assure an adequate, wholesome food supply, emphasizing locally-grown, (organic, seasonal), foods at reasonable cost.

Develop a level of public knowledge and understanding of foods (and the food system) and nutrition which will promote optimal nutrition, health, well being (and responsible consumer actions).

Objective 1: Coordinate state nutrition education and food assistance efforts to maximize their effects.

Recommend that:

a. The agencies involved in nutrition and food assistance coordinate their activities toward the stated goal.

b. The following subjects be added to nutrition education programs in addition to traditional subject matter:

- the contribution of locally-available, (seasonal, organic), locally produced and processed foods to the diet.
- the relationship between nutrition and health.
- methods of food purchasing, preparation, preservation, and storage to maximize nutritional value and minimize waste.
- the role (and responsibilities) of the consumer in the food system (e.g. the importance of consumer demands and buying practices in determining the structure of the marketing system and hence, where our food comes from, and e.g. the health and ecologic effects of over-consumption of grain-fed meats).

Objective 2: Provide teachers and food service workers with accurate nutrition information.

Recommend that:

a) Health education, including nutrition, be part of teacher educational programs.

Objective 3: Integrate nutrition education into the Food Stamp Program.

Recommend that:

a) State agencies with expertise in nutrition assist the Food Stamp Program in nutrition education.

Objective 4: Strengthen and maintain the systems for food quality and safety control.

Recommend that:

a. Safety and quality inspection systems expand to meet the increase in local food production and processing.

b. Food safety inspections of public food service establishments be increased.

c. Workers in food service establishments and institutions obtain training in safe food production and serving practices.

d. Food service establishments make available information on the identity of, and the ingredients in, foods which they serve.

e. The need for labeling regulations be examined as food processing and production increases in New Hampshire.

Objective 5: Encourage the growth and development of a coordinated consumer food cooperative system.

Recommend that:

a. Leadership be provided by the New Hampshire Department of Agriculture (and outside assistance be sought from organizations such as the New England Federation of Food Coops).

b. The University of New Hampshire Cooperative Extension Service assist in providing information and training for consumer food cooperatives.

Objective 6: Gather information on the nutritional status and food consumption patterns of the population of New Hampshire (so we don't need to rely on national per capita averages, which may not represent what is consumed in New Hampshire.)

Recommend that:

a. The Division of Public Health Services of the New Hampshire Department of Health and Welfare conduct regular data collections (with the cooperative help of consumers).

Objective 7: Provide information on the nutritional contribution of locally-available (organic, in-season) produced and processed foods.

a. The New Hampshire Agricultural Experiment Station develop and coordinate research (and that the extension service makes this information available).

(Objective 8: Provide information to consumers about what they can do, how they can organize and work to support local agriculture and a stable food system).

LAND USE

GOAL: Preserve land that is presently in agriculture.
Expand agriculture to land capable of production.

Objective 1: Encourage and assist private development and all levels of government to utilize soils (and sites) poorly suited to agriculture.

Recommend that:

a. The Offices of State Planning and Regional Planning, with the assistance of agencies such as the Soil Conservation Service, the Conservation Districts, the Cooperative Extension Service, and others, research and develop an educational package which will provide communities with guidelines on needed land treatment to assist building on soils (and sites) poorly suited to agriculture.

Objective 2: Encourage publicly-owned lands suitable for food production to be made available for commercial, small and part-time farming and for community gardening (and community orcharding).

Recommend that:

a. Conservation Commissions in each community assess the agricultural potential of the publicly-owned lands within their jurisdiction and publicize their availability, (and the community residents organize and determine the most feasible ways to put that land into production).

Objective 3: Compensate landowners who voluntarily choose to protect agricultural lands permanently.

Recommend that:

a. Support be given to the passage of the Agricultural Encouragement and Lands Preservation Act (Revitalization of the PDR Act) and the continuation of the Current Land Use Assessment Act.

Objective 4: Encourage the revision of zoning ordinances to allow agricultural uses in residential areas.

Recommend that:

a. The Offices of State Planning and Regional Planning develop and promote systems which will encourage agricultural production in residential, industrial, and business areas in communities of the state.

Objective 5: Encourage good conservation practices on all agricultural land to ensure long-term productivity.

Recommend that:

a. Through the joint action of the Soil Conservation Service, Agricultural Stabilization and Conservation Service, The University of New Hampshire, and the Conservation Districts, an integrated program be developed that will help to:

- Conserve the agricultural soils of New Hampshire.
- Develop practices that improve the productive capacity of agricultural soils.
- (Encourage no-tillage practices in New Hampshire through education and assure an adequate supply of no-till equipment, which is a current limitation.)

Objective 6: Develop and encourage ways in which we could produce the most from our farmland without diminishing its quality, e.g.:

a. Encourage the production of high-yielding and highly nutritious foods, e.g. using our cropland to grow soybeans rather than for livestock silage.

b. Develop and encourage the use of intensive horticultural techniques which are more labor-intensive but give much greater yields than conventional techniques.

(c. Develop alternative food sources which are indigenous to New England or fit into the New England ecosystem, e.g. wild foods, developing treecrops suitable for human consumption or livestock feed, to make the most of our hilly lands.)

AGRICULTURAL PRODUCTION

GOAL: (Continued recognition that)... agriculture is an important industry in the balanced growth of New Hampshire.

Maximize New Hampshire's commercial food production and encourage small and part-time (and diversified) farming and home food production toward family and community self-sufficiency.

Objective 1: Increase production by commercial farmers so that, as the opportunities arise for the New Hampshire producer to compete, the resources will be available to meet the demands.

Recommend that:

a. The State Department of Agriculture, University, and farm related groups work with the suppliers of production inputs so that there will be an improvement in the timeliness, selection, and price of these supplies and services.

Objective 2: Promote home food production so that those with the potential to produce food on their own property will be able to provide a portion of their food needs.

Recommend that:

a. Educational programs of the University of New Hampshire Extension Service be directed more vigorously to the home food producer and the suppliers of their production inputs, and home garden supply businesses be further encouraged to help the home producers by providing production information and other services.

Objective 3: Promote research on agricultural production methods which are less dependent on petroleum-based products (including the development and establishment of new cultivars which require fewer energy inputs, such as perennial crops and food producing trees.)

Recommend that:

a. The Cooperative Extension Service, Agricultural Stabilization and Conservation Service, Soil Conservation Service, and Conservation Districts encourage farmers to make the best use of manure and other organic waste and composting to improve the productivity of soils and to reduce production costs. Further application should be made in the use of community organic wastes such as sewage sludge, leaves, brush, and garbage, so that this soil conditioning is safe and economical and is applied to the soil using proper techniques.[71] (Encourage the use of other organic techniques of food production, such as the use of IPM rather than chemical pesticides).

Objective 4: Encourage the increased productivity of the small and part-time farmer and identify the ways these farmers can play an increasing role in food production.

Recommend that:

a. Increased attention be given to the needs of new farmers, whether large or small, and the special needs of the small and part-time producer by agricultural agencies at the state and federal level and by farm organizations in the areas of production, land use, marketing, and business (and resource) management. (Work to eliminate or reduce the high start-up costs for beginning farmers.)

(Objective 5: Encourage agricultural production by developing ways in which farmers can process and market their products locally, such as local cheese and yogurt production.)

(Objective 6: Encourage production by encouraging diversification; diversified production is much more efficient in terms of natural resources, and is both economically and ecologically more stable.)

FOOD PROCESSING AND STORAGE

GOAL: Have processing and storage facilities and services which will adequately serve the needs of New Hampshire's farmers, and have storage facilities which ensure an adequate supply of food for New Hampshire throughout the year.

Objective 1: Create a food processing industry in New Hampshire which meets the needs of producers and consumers within the local economy and complements the industrial growth of the state.

Recommend that:

a. Private industry and public institutions encourage the development of processing and storage facilities for all commodity areas; that consumers and food industry be encouraged to accept minimum processing, including packaging, which should reduce energy consumption and food costs and retain the inherent value of food; and energy-efficient facilities and methods for processing and storing of New Hampshire-grown and consumed products be researched.

Objective 2: Expand livestock slaughtering and storage facilities in proportion to an increased production (not clear if this is necessary).

Recommend that:

a. State inspection criteria for slaughtering and meat and poultry processing be established within the State Department of Agriculture.

Objective 3: Fund and administer a pilot project for food processing to serve institutional needs and evaluate the transferability of this concept for application throughout the state (The Concord public school system's efforts to store locally grown winter vegetables for school lunches can serve as a similar kind of pilot project).

Recommend that:

a. Community and home processing and storage facilitites for the use of the family and commercial producer be established so that economies in equipment and energy consumption can be realized (this is an area in which citizen organizations can be extremely effective).

(Objective 4: Encourage small local food processing and storage whenever possible, without sacrificing health and safety standards. Disseminate information on freezing, canning, root cellaring produce, processing and storing dairy products, home butchering and storage of meats, emphasizing safe and healthy methods.)

TRANSPORTATION

GOAL: Provide efficient transportation of food and feed products from producer to consumer in a timely manner.

Objective 1: Maintain and repair bridges and roads of the state highway system for transport of agricultural products to and from the farm. Encourage State Public Works and Highway municipalities to inspect, repair, and adequately maintain bridges and construct and maintain rural roads over state highways.

Recommend that:

a. The New England Governors convene a meeting of the various highway departments toward establishing uniform trucking regulations throughout the six-state region.

Objective 3: Correct the inequity of freight rates between the Northeast and the South.

Recommend that:

a. Our Congressional representation work for de-regulation of all trucking of agricultural and food products, including immediate relaxation of back-haul regulations; further, our Congressional representation continue effort toward obtaining equitable and non-descriminatory freight rates in New England.

Objective 4: Work toward the establishment of a grain storage facility in central New England for emergency use.

Recommend that:

a. The state of New Hampshire support efforts to establish a regional grain storage program that ensures a basic feed grain supply at minimal cost, allowing unit trains and or water shipments into the region.

(Objective 5: Continue developing food and agriculture systems that depend less and less on outside inputs of fuel, imported grain, fertilizers and other chemicals, so that transportation becomes less necessary.)

MARKETING

GOAL: Enhance the food marketing systems in New Hampshire by facilitating the access of consumers to products in New Hampshire and the New England region (and for consumers to make a great effort to support this new marketing system) to benefit the producer, the consumer, and the general economic welfare of the state.

Objective 1: Assist those sectors of the food and fiber system in New Hampshire fully aware of their role in the system by describing and understanding the present system, the limitations and problems of the system, and the opportunities for improving the system.

Recommend that:

a. The State Department of Agriculture begin immediately to provide an Annual Food and Fiber report of the marketing system in New Hampshire that measures and assesses the system, analyzes the weaknesses, and provides reasoned and practical alternative solutions to the problems.

Objective 2: Provide for a more efficient and economical marketing system by promoting and instituting alternative marketing outlets and institutions which will enhance the system's ability to serve the food needs of New Hampshire consumers and producers.

Recommend that:

(a. The "Nature-ly New Hampshire" campaign be revitalized, continuing to promote and advertise New Hampshire-grown products. Continued work on the specific tasks:)

- * working with wholesale/retail, hotel and institutional marketing channels to determine how producer cooperatives can market to these groups economically, efficiently, and competitively.
- * providing technical assisance in the production, financial, and marketing areas.
- * providing an environment which brings together the producers to form the cooperatives (and the producers to make a greater effort to work together and with buyers).
- * assisting these cooperatives in becoming economically self-sufficient and independent of governmental control and involvement.
- * (encourage and assist producers to comply with buyers' needs of grading, washing, packing, cooling, etc., of produce).

Objective 3: Continually assess and evaluate the problems and efficiencies of the system and continue to examine and present alternatives and solutions which will make for the most efficient and economic marketing of food products in New Hampshire.

Recommend that:

a. The extent to which state laws work to erect marketing barriers and eliminate or reduce competition by New Hampshire state institutions be examined; quality premiums be evaluated and implemented when economical. (Pass legislation which strongly encourages that state institutions buy locally grown and raised foods whenever possible, modelled on the recent Massachusetts bill).

(Objective 4: Facilitate and develop other direct marketing channels for produce, dairy, meats, etc.).

OVERALL RECOMMENDATIONS:

1. Some office, organization, or committee should conduct on-going monitor studies of the food and agriculture system in New Hampshire, collecting up-to-date information on consumer needs, land use, agricultural production, food processing and storage, transportation and marketing, and provide appropriate feedback about various programs to state and university officials, organizations, and the public. For example, at present, very little is known about home food production and storage in New Hampshire; this information is important.

2. There should be on-going efforts to work with other New England states in an effort to cooperatively solve our similar food system problems (an example of this is the New Hampshire and Vermont cooperative marketing study, "Selling Locally Grown Produce").

3. There should be a regular forum held annually for all interested people to meet and discuss ideas and plans for developing a stable food system and to share successes and failures. This creative dialogue would foster a greater awareness of issues surrounding our food system and could function as another form of feedback to people involved in various programs and organizations, and would foster a strong, positive feeling of cooperation and working together to solve our own problems. This could be held at the university, in conjunction with the NOFA conference, or as a separate conference.

RECOMMENDATIONS FOR A NEW HAMPSHIRE FOOD POLICY: SOME GENERAL OBSERVATIONS FOUR YEARS LATER - Richard Mark*

It has been four years since the New Hampshire Legislature and New Hampshire's Governor, the late Hugh Gallen, ratified the "Recommendations for a New Hampshire Food Policy."

While there has been some progress in working towards some of the recommendations in the report, there are several major areas that still lack emphasis by local and state agricultural authorities.

1. Farm Land Preservation...while a strong and vital agriculture industry is the best method of preserving farm land, there are a number of short-term solutions, such as the buying of development rights by state government. New Hampshire is just completing its first full cycle under a very limited development rights program which has spent monies to date to preserve approximately 1,000 acres of prime farm land. The financial well is now dry, however, and attempts to have the state commit additional monies to keep the program going for another two years have failed. Given the state's precarious financial position, it is unlikely that such a program will be funded anytime in the near future. If so, there will be no established farmland preservations program in the state as of July, 1983.

State government continues to use prime farm land for the building of new state buildings, the latest example being a training academy for state police recruits, built on some of the best "river bottom" land available in Merrimack County. Coordination of state facility development and the agriculture department's priorities appear to continue to be lacking.

One bright spot in this issue is the City of Concord, New Hampshire's capitol, where the City Planning Board and City Council are soon to begin wrestling over a plan to transfer development rights for prime farm land within the city, a plan that would override other zoning laws in specific agricultural zones.

2. No major activity has taken place relative to encouraging and establishing food processing and storage facilities in the state. While the Central New Hampshire Agricultural Marketing Project will be developing a pilot project to test the feasibility of such a project in the Merrimack Valley region this fall, no other activity appears to be planned in the state. Apple growers, now facing a market glut in the next few years, are beginning to think about the need for regional storage and processing facilities, but the state has given no substantial support for such activities to date.

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3. The state, due to the lack of financial resources, continues to slight the development of alternative marketing structures, although the Department of Agriculture has recently assisted the state's apple producers in the development of a statewide "marketing order". The Merrimack Growers' Co-op continues to be successful based on the energies and talents of the farmers who own and operate the Co-op. The Co-op sold over $50,000 of local produce in the Merrimack Valley during the 1983 season, thanks primarily to the support and encouragement of Shaws Corporation, a local company committed to buying local produce in northern New England.

The entire budget of the Department of Agriculture for marketing and promotions totals less than $2,000. Assistance with new marketing groups will have to continue to come from independent groups such as the Central New Hampshire Agricultural Marketing Project that gave birth to the Merrimack Growers' Coop.

Some hopeful signs: New Hampshire's recently appointed Agriculture Commissioner, Stephen Taylor, is quickly being seen as a strong advocate for New Hampshire's agricultural industry and is a strong spokesperson for diversified farming in New Hampshire.

Through the efforts of the Commissioner, an "Agricultural Forum" is being established, a forum that will bring together a variety of agricultural interests in the state on a periodic basis for the sharing of ideas and for reacting to agricultural policy development in the state

Legislative efforts, led by New Hampshire's current Governor, to "streamline" state government are threatening to break up the present Department of Agriculture and reduce its status as a major state department, thus assigning many of the Department's responsibilities to other agencies unfamiliar with the needs of local farmers. Farmers and agricultural officials are closing ranks to fight such efforts.

The most significant failure of the "food policy" work is its inability to build a public constituency for New Hampshire agriculture, a constituency that supports local agriculture in town, county and state land use battles and one that can demand that local stores buy and sell locally produced agricultural commodities. The need remains for increased educational emphasis on New Hampshire's food system and for public pressure to follow-up on the original recommendations of the food policy statement.

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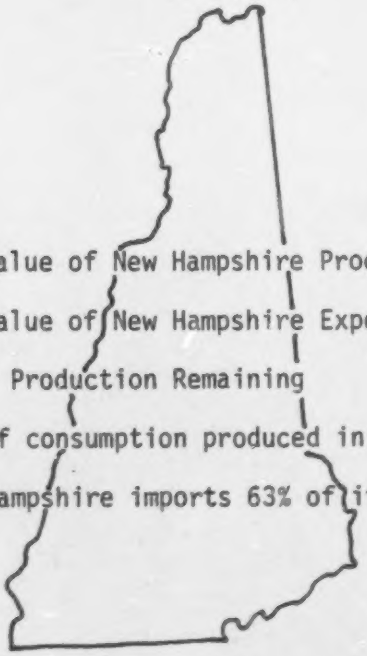
APPENDIX

Broken down stone fences and old cellar holes are often the only evidence left of New Hampshire's agricultural heritage. During the late 1700's and early 1800's, grains, fruits, vegetables and livestock were all produced in New Hampshire, with surpluses being sent to the urban markets of Boston, New York, and Philadelphia. Only one hundred years ago, New Hampshire agriculture supported 32,000 farms. However, as the country's transportation system was expanded, New Hampshire farmers couldn't complete with the long growing seasons and deep fertile soils of the mid- and southwest. Many farmers left New Hampshire or went out of business. Soon, most of the food New Hampshire residents consumed was trucked in from all around the country.

Since the mid-1970's, the ways our food is produced, processed and brought to us have been an important concern in New Hampshire. Public and private organizations have started to work together to find ways to develop a sustainable food system for New Hampshire. Producing more food in-state provides income for New Hampshire's farmers and food processors, and provides consumers with fresh, moderately priced food. There is still much to be done to make New Hampshire's food system sustainable. Farmland must be preserved for agricultural use. Processing and storage facilities are needed to keep surpluses through the long winter. Consumers should learn the benefits of home food production and preservation techniques. These are just a few of the steps that will help New Hampshire develop a safe, affordable, economical food system.



Retail Value of New Hampshire Production	$950,936,500
Retail Value of New Hampshire Exports	357,324,500
Value of Production Remaining	$593,612,000

37% of consumption produced in New Hampshire

New Hampshire imports 63% of its food.

NEW HAMPSHIRE FOOD IMPORTS

COMMODITY	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
	Retail Weight (1,000 lbs.)	Retail Value	Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of NH Consumption
Meats									
Beef and Veal	7,738.50	20,932.8	71,807.6	195,833.1	89	169,611.4[a]			522,231[b]
Lamb and Mutton	200.2	422.3	1,196.8	2,252.2	83.3	1,876.1			10,566
Pork	2,291.9	3,552.4	63,061.8	97,682.7	96.4	94,166.1			44,844
Poultry									
Chicken	3,209.8	2,311	46,030.6	33.694.3	93	31,335.7			1,973
Turkey	448	439	9,666.4	9,463.4	95.4	9,028.1			6,732
Eggs	20,497.2	11,867.9	31,853.1	18,442.9					15,585
Fish (fresh, frozen, cured)	4,614[c]	10,704.5	11,691.7	27,124.9	61	16,546.2			
Dairy Products									
Butter	-0-		4,050.7	8,077	100	8,077.1			
Cheese, hard	10.4[d]		16,202.7	37,590.4	99.94	37,567.8			
cottage	-0-		40,967.1	37,280.1	100	37,280.1			
Evaporated and condensed milk	-0-		6,536.3	4,588.5	100	4,588.5			59,436[e]
Fluid milk and cream	344,000	808,400	209,899.1	498,262.8			39	315,276	
Frozen dairy products	4,948[f]	19,940.4	17,031.3	68,653.1	71	48,743.7			
Vegetables, fresh[g]									
Artichokes	-0-		276.2	104.95	100	104.9			
Asparagus	360	385.2	276.2	295.5			23.3[h]	89.7	138
Broccoli	100	820	1,567	1,284.9	94	1,207.8			180
Cabbage	3,600	864	7,733.1	1,886.9	53	1,000			348
Carrots	126	46.6	5,615.7	2,055.4	97.7	2,008.1			208
Cauliflower	240	196.8	1,196.8	981.4	80	785.1			122
Celery	22.2	9.3	6,720.5	2,842.8	99.7	2,834.3			851
Cucumbers	2,000	1,020	3,682.4	1,892.8	46	870.7			326

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NEW HAMPSHIRE FOOD IMPORTS (cont.)

	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
COMMODITY	Retail Weight (1,000 lbs.)	Retail Value	Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of NH Consumption
Vegetables, fresh									
Eggplant	96	43.2	460.3	207.1	79	163.6			25
Escarole	NC		552.4	198.8					43
Garlic	NC		736.5	1,348.5					57
Green pepper	420	411.6	3,038	2,998.5	86	2,578.7			307
Lettuce	700	343	22,923.2	11,186.5	97	10,850.9			873
Mushrooms	NC		819.3	1,427.3					
Onion and Shallots	120	48	9,390.2	3,754.2	99	3,716.6			317
Potatoes	137,500	34,375	45,386.1	11,328.4			67^h	23,031.2	1,739
Snap beans	1,200	876	1,196.8	878.4					374
Spinach	200	232	644.4	747.5	69	515.7			86
Sweet corn	NC		6,076	2,339.3					769
Sweet potatoes	-0-		3,130.1	845.1	100	845.1			
Tomatoes	1,584	1,219.7	10,531.8	8,108.4	85	6,892.1			524
Vegetables, processed									
Asparagus, frozen	-0-		55.2	145.3	100	145.3			60
canned	-0-		276.2	576.5	100	576.5			169
Beets, canned	-0-		1,104.7	345.8	100	345.8			46
Broccoli, frozen	-0-		1,288.9	786.2	100	786.2			256
Brussel Sprouts, frozen	-0-		230.2	147.3	100	147.3			25
Carrots, frozen	-0-		856.2	847.6	100	847.6			53
canned	-0-		460.3	248.6	100	248.6			23
Cauliflower, frozen	-0-		423.5	498.9	100	498.9			98
Corn, frozen	-0-		1,775.8	1,140.4	100	1,140.4			807
canned	-0-		5,339.6	2,189.2	100	2,189.2			1,175
Lima beans, frozen	-0-		276.2	251.3	100	251.3			143
canned	-0-		432.7	237.9	100	237.9			112
Mushrooms, canned	-0-		1,233.6	4,650.7	100	4,650.7			
Onions, frozen	-0-		626	563.4	100	563.4			25
Peas, frozen	-0-		1,417.7	1,034.9	100	1,034.9			1,293
canned	-0-		3,038	1,427.9	100	1,427.9			879

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NEW HAMPSHIRE FOOD IMPORTS (cont.)

COMMODITY	PRODUCTION Retail Weight (1,000 lbs.)	Retail Value	CONSUMPTION Retail Weight (1,000 lbs.)	Retail Value ($1,000) (198r dollars)	IMPORTS % Import	Retail Value of Import ($1,000)	EXPORTS % Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of NH Consumption
Pickles, canned	1,500[1]		6,352.2	4,700.6	76	3,572.5			453
Potatoes, frozen	-0-		15,559.3	9,770.6	100	9,770.6			1,323
canned	-0-		1,196.8		100				72
Pumpkin & Squash canned	-0-		368.2	228.3	100	228.3			
Saurkraut	-0-		1,104.7	441.9	100	441.9			44
Snap beans, frozen	-0-		920.6	672	100	672			22
canned	-0-		5,707.8	2,568.5	100	2,568.5			736
Southern greens, frozen	-0-		220.9	190	100	190			
Spinach, frozen	-0-		690.4	548.9	100	548.9			45
canned	-0-		460.3	234.7	100	234.8			27
Sweet potatoes	-0-		920.6	552.4	100	552.4			
Tomatoes, whole	-0-		5,615.7	2,852.8	100	2,852.8			185
pulp & puree	-0-		736.5	374.1	100	374.1			24
catsup, paste, sauce	-0-		8,745.8	6,384.4	100	6,384.4			288
juice, & veg. juice	-0-		2,945.9	854.3	100	854.3			97
Other, canned	-0-		2,025.3		100				
Fruits, fresh									
Apples	44,982	25,414.8	14,729.8	8,322.3			67	17,027.9	1,386
Bananas	-0-		19,148.7	6,931.8	100	6,931.8			
Blueberries	2,000								
Cherries	-0-		552.4	679.4	100	679.4			
Citrus, Grapefruit	-0-		7,180.8	2,836.4	100	2,836.4			
Lemon/Lime	-0-		2,117.4	1,481.1	100	1,481.1			
Oranges/Tangerines	-0-		15,640.4	6,240.5	100	6,240.5			
Tangelos	-0-		644	399.5	100	399.5			
Grapes	180[1]	187.2	3,341.2	3,474.8	94.6	3,287.2			
Melons	240	21.6	15,558.3	1,400.2	98.5	1,379.2			1,944
Peaches/nectarines	400	220.8	6,444.3	3,557.3	93.8	3,336.7			816
Pears	475	280.3	2,209.5	1,303.4	78.5	1,023.2			320
Plums & prunes	-0-		1,380.9	359	100	359			1,751
Raspberries	100	125							
Strawberries	3,000	2,943	1,565	1,535.3			47.8	1,406.7	313

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NEW HAMPSHIRE FOCD IMPORTS (cont.)

	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
COMMODITY	Retail Weight (1,000 lbs.)	Retail Value	Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of NH Consumption
Fruits, processed									
Frozen fruits	NC		2,550.1	3,238.6					
Frozen citrus juices	-0-		11,664.1	16,327.5	100	16,327.5			
Canned & chilled fruits	NC		16,202.7	8,587.4					
Canned & chilled fruit juices	NC		15,908.1	6,204.2					
Dried fruits	NC		2,706.6	4,492.9					
Grains and Legumes									
Barley	-0-		1,104.7	541.3	100	541.3			429[k]
Corn flour & meal	-0-		6,904.6	3,176.1	100	3,176.1			
Corn cereal	-0-		2,117.4	3,091.4	100	3,091.4			1,923 (all corn flour
Corn starch	-0-		1,749.2	979.5	100	979.5			
Oats	-0-		2,853.9	2,054.8	100	2,054.8			1,889
Rice	-0-		8,561.7	4,820.2	100	4,820.2			
Rye	-0-		644.4	167.6	100	167.6			470
Soybeans (grits & flour)	-0-		1,841.2	1,270.4	100	1,270.4			1,145
Wheat flour	-0-		107,711.4	241,811.2	100	241,811.2			
Wheat cereal	-0-		2,577.7	3,660.3	100	3,660.3			69,962 (all wheat)
Dry beans	NC		5,983.9	4,009.3					
Dry peas	NC		368.2	147.3					
Fats & Oils									
Lard	190.4	131.4	2,301.5	1,588.1	92	1,461			
Margarine	-0-		10,310.8	7,609.4	100	7,609.4			
Shortening	-0-		16,847.1	13,107.9	100	13,107.9			
Other oils	-0-		20,897.8	18,808.1	100	18,808.1			108,957[l]

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NEW HAMPSHIRE FOOD IMPORTS (cont.)

COMMODITY	PRODUCTION		CONSUMPTION		IMPORTS		EXPORTS		
	Retail Weight (1,000 lbs.)	Retail Value	Retail Weight (1,000 lbs.)	Retail Value ($1,000) (1981 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Required to produce 100% of Consumption
Sweetners									
Cane & beet sugars	-0-		76,963	30,777.5	100	30,777.5			16,034[m]
Honey	92	147.2	1,104.7	1,778.6	92	1,636.3			
Maple syrup (gal.)	105	2,004.5	92.1	1,757.1			12.3	246.5	
Corn syrup	-0-		37,008.5	27,016.2	100	27,016.2			
Molasses & other syrups	-0-		460.3	764.1	100	764.1			
Other									
Coffee	-0-		7,180.8	18,167.3	100	18,167.3			
Tea	-0-		736.5	905.9	100	905.9			
Cocoa	-0-		2,393.6	8,760.5	100	8,760.5			
Tree nuts	-0-		1,583.5	5,272.9	100	5,272.9			
Peanuts	-0-		580[n]	1,322.4	100	1,322.4			
TOTALS	589,490.6	950,936.5	1,194,778.	1,621,860.46		978,995.6		357,324.5	

NOTES NEW HAMPSHIRE FOOD IMPORTS CHART

Statistics from: USDA, Agricultural Statistics 1981 (Washington, D.C.: GPO, 1981); New England Crop and Livestock Reporting Service, New Hampshire Agricultural Statistics 1980 (Concord: New Hampshire Department of Agriculture, 1981); USDA, Economic Research Service, Statistical Bulletin No. 672 Food Consumption, Prices and Expenditures (Washington, D.C.: GPO, 1981).

a. Retail Value for beef imports only.

b. Includes acreage required for beef consumption only. Veal acreage is included in dairy acreage.

c. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Fisheries of the United States 1981 (Washington, D.C.: GPO, 1981). Retail weight is estimated to be 60 percent of liveweight.

d. There is one cheesemaker in New Hampshire.

e. Durgin, Henry, Kaye and Nelson, New Hampshire Agriculture and Forest Industries, Part I, Dairy and Beef (Concord: University of New Hampshire, 1976). Includes all dairy products and veal.

f. 1980 data.

g. Fresh vegetable production from Otho Wells, Cooperative Extension Service, through Carol Houghtaling, Moving Toward a Goal: Food Self-Sufficiency for New Hampshire, 1982.

h. In fact, New Hampshire both imports and exports these crops, depending on the season. This is true of other food items as well.

i. One processor in New Hampshire produces piccalilli and relish.

j. Fruit production from William Lord, Cooperative Extension Service, University of New Hampshire.

k. Barley, oats and wheat acreage based on yields reported in "Small Grains," New England Farmer, June 1982.

l. Acreage required if all oil is soybean oil.

m. Based on yield of 4,600 pounds of refined sugar, (from beets) per acre.

n. Based on 1977 per capita consumption.

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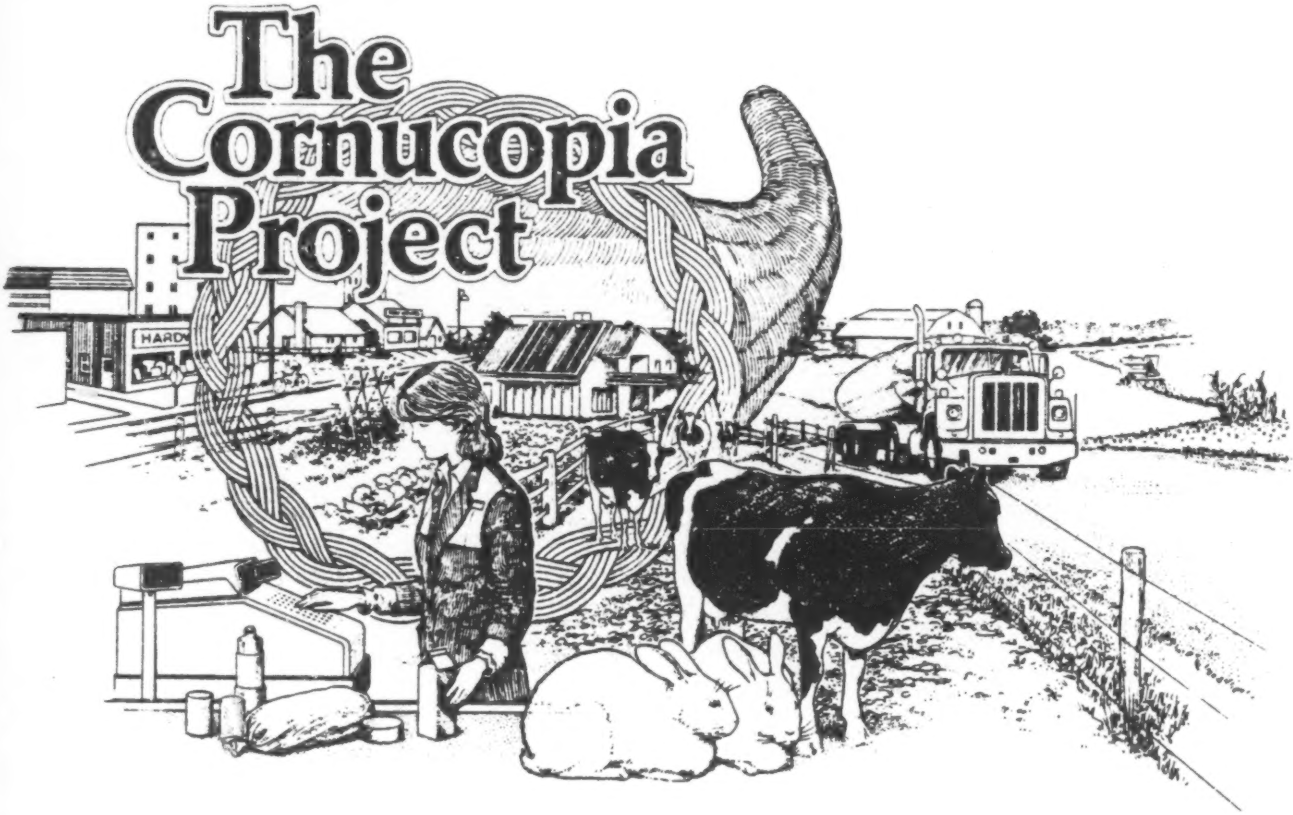

THE KENTUCKY CORNUCOPIA: RENEWABLE RESOURCE FOR ECONOMIC DEVELOPMENT

A Study of the Kentucky Food System

by
MICHAEL J. GREENE
Kentucky Research and Services

for

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1983

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BIBLIOGRAPHY

On a quiet street in Frankfort, Kentucky, an historic plaque marks the place where bibb lettuce was first produced.

As with many other historic markers across the Bluegrass state, this plaque might be read in passing, its significance reduced by the passage of time. But, looking back beyond the late 1860's when John Bibb was working in his garden, Kentucky grew an abundance of food.

In addition to the flax, hemp, and tobacco which generated the greatest income for Kentucky farmers, the post-settlement Census show that our state produced a wide variety of edible foods.

By the early 1800's Kentucky farm products provided an important attraction to food wholesalers at the Port of New Orleans and this trade generated significant income for our state's farmers.

During this period, the legendary Colonel Wilkerson, whose entrepreneurial spirit made him a fortune, had organized an export business through which Kentucky farmers obtained scarce, hard cash in return for their labor upon our productive soils.

At the time bibb lettuce was being developed in Kentucky, better than half of our working population was employed on Kentucky's 78,000 farms which covered about 6 million acres.

This labor, in conjunction with our good soils and climate, put Kentucky in the top half of all states in the production of honey and maple syrups, fruits, wool, oats, rye, barley, and potatoes and ranked it 6th among the 31 states in total value of all livestock raised.

By 1900, almost 20% of the state's 2 million people worked on Kentucky's 240,000 farms or at farm-related jobs. And, though it represented a decline from its peak in the 1940's, 25% of Kentucky's employed population worked on farms in 1960.

Today, Kentucky leads the nation in the production of tobacco and is near the top among soybean producers. We export hogs and produce more milk than we consume. But, we no longer feed ourselves. In fact, Kentucky is now dependent upon others for 63% of its food.

To the casual observer, our importing of food may seem of no greater significance than our importing other commodities such as clothing or televisions or cars and trucks. But food is different from other commodities and, for this reason, its source and supply warrants closer attention.

Food is a necessity for which there is no substitute. Unlike the oil embargo of the early 1970's, whose impact was reduced by substitution, a comparable disruption in the U. S. food system would not lend itself to a similar solution.

Although the U. S. is a food exporter, production of vegetables and fruits is concentrated in two or three areas of the country. A prolonged period of adverse weather in these areas, or a protracted disruption of the transportation system which brings these foods to Kentucky, would quickly result in the depletion of stocks of these foods in our state.

Kentucky is capable of producing much more of its own foods than it does. The long term benefits of maximum utilization of our state's renewable resources would be significant over and above the relatively greater security doing so would provide. In this respect, food production for in-state consumption has been overlooked by our state's economic development strategists.

This report highlights some of the factors which contribute to Kentucky's need to import 63% of its food. It consists of a summary analysis of our state's agricultural resources and what products they to produce; a detailed estimate of what types and quantities of foods are imported to Kentucky; estimates of the employment and income benefits which might result from increased food production for in-state consumption; discussion of some of the factors which have affected food production for human consumption in Kentucky; and recommendations for action to reduce food imports to Kentucky.

This report is not a complete harvest of all the information which is relevant to the subject of food imports to Kentucky. It is, at best, a seed bed from which ideas and the will to make our state a cornucopia may sprout.

KENTUCKY IMPORTS 63% OF ITS FOOD

The 1980 Kentucky Food Imports Chart at the back of this report shows that Kentucky imports 63% of its food. The Chart was prepared to help provide a focus for Kentuckians who are interested in where our food comes from and who produces it.

It attempts to picture the Kentucky food system by showing how much of the basic foods we ate in 1980, what we paid for them, how much was produced in Kentucky, and how much land was used to produce what we ate.

The Chart assumes that our eating habits were similar to the nation's in 1980 and that when we ate more of an item than was produced by Kentucky farmers, we imported the difference.

For example, the first item on the Chart, listed under MEATS, is beef. Under the KENTUCKY PRODUCTION heading, the first two columns show that Kentucky farmers produced 82 million pounds (retail weight) of beef in 1980 and that this sold, at retail, for $222 million dollars.

Under the next heading, KENTUCKY CONSUMPTION, column 3 shows that our consumption of beef in 1980 was 247 million pounds or roughly three times greater than our production. Column 4 shows that the retail value of the beef we ate in 1980 was $667 million dollars.

Column 5, under the KENTUCKY IMPORTS heading, shows that in order to make up the difference between what we consumed and what we produced, we imported 67% of our beef in 1980. Column 6 shows that over $444 million left Kentucky to pay for this imported beef.

Columns 7 and 8, under the heading KENTUCKY EXPORTS, are, blank for beef because we produced less than we consumed. The last column on the Chart, under the heading of LAND REQUIREMENTS FOR KENTUCKY CONSUMPTION/ACRES, shows that it would take approximately 850,000 acres to produce the quantity of beef we consumed in 1980.

The totals along the bottom of the Chart show that the retail value of Kentucky's production of the items listed amounted to about $1.7 billion. They also show that about $600,000 worth of these items were produced in amounts exceeding our estimated consumption of them and were therefore exported.

By subtracting the value of our exports from the value of our production of the items listed, the Chart shows that the retail value of the agricultural production which remained in Kentucky ($1.1 billion) equaled about 37% of the total retail value of the listed foods which were consumed by Kentuckians in 1980.

Put another way, this means that 63¢ of each food dollar Kentuckians spent for the foods listed on the Chart paid for foods from as far away as California, Washington, or Colorado.

In reviewing the Chart, the two most important columns are % IMPORTS (Column 5) and LAND REQUIREMENTS (Column 9) because they show the extent to which Kentucky is dependent upon producers in other states for each type of food, and the amount of land used to produce what we ate in 1980. (Blanks on the Chart indicate that data for a food item was not available.)

Reading down the Chart, Column 5 shows that in 1980 Kentucky imported nearly 100% of its consumption of fresh and processed vegetables and fruits, turkey, fish and 90% or more of its veal, lamb, and chicken.

The total at the bottom of the last column shows that it took about 2.2 million acres to produce the quantities of the listed foods we ate in 1980.

The Chart raises many questions for Kentuckians. The following section sketches the outlines of possible answers to some of these, and as an interested Kentuckian, you are encouraged to raise and answer your own questions.

CHART RAISES QUESTIONS

The 1980 Kentucky Food Imports Chart raises interesting questions for Kentuckians.

As food consumers, we might ask whether our trips to the grocery store would be less expensive if food prices did not include shipping costs from other parts of the country.

As farmers/businessmen, we might wonder whether and how we could tap the $1.79 billion food market which Kentucky's food imports represents. If you raised beef cattle, you might question why beef produced in other states should capture over $444 million of Kentucky's retail food dollar.

Public officials might think about the number of new Kentucky jobs the production and processing of more of our own food would generate.

Unfortunately, there are no hard and fast answers to these questions. For this reason, perhaps more than any other, they need to be raised and to be answered.

WHAT FOOD IMPORTS MEAN TO KENTUCKY CONSUMERS

By manipulating some of the numbers shown on the Chart, we can sketch the broad outlines of an answer to the question which might be raised about the transportation costs of imported foods.

In 1980 Kentuckians ate an estimated 4.1 billion pounds of the foods listed on the Imports Chart. Of this total, about 3 billion pounds (of which 2.2 billion pounds was milk) were produced in Kentucky and 1 billion pounds were imported.

Assuming that most of our imports are delivered to Kentucky by trucks, each carrying A 40,000 pound load, our imports in 1980 required 428,293 trucks! Parked bumper-to-bumper, these 428,293 trucks would stretch 4,867 miles - from Kentucky to California and back!

By dividing the totals along the bottom of the Chart by Kentucky's 1980 population (3.5 million) we can say that for each Kentucky food consumer in 1980, $865 was spent for the food items listed on the Chart. Assuming 3.1 people per family, we can estimate that $2,681 was spent by each Kentucky household in 1980 for the food shown on the Chart.

By multiplying these two numbers by the estimated level of imports to Kentucky (.63%) we can say, overall, that $511 per capita, and $1,689 per household, left Kentucky to pay for food grown elsewhere.

Estimating that food transportation costs equal about 5% of the retail price, $25 of the $511 per capita expenditure and $84 of the $1,680 per household expenditure for imported foods in 1980 paid for transportation of that food to Kentucky.

This means that the upper limit of the amounts of money food consumers in Kentucky could save every year if our State produced more of its own food is $90,000,000.00!

WHAT FOOD IMPORTS MEAN TO KENTUCKY FARMERS

The questions raised by farmers/businessmen are more difficult to answer. Many factors and forces affect food production on a commercial basis, and many of them are beyond the control of the farmers.

However, taking these many factors into consideration, it is estimated that Kentucky farmers could double their incomes by using their land to its maximum capability within the context of good soil and water conservation practices.

According to a 1977 study of Kentucky's agricultural potential, by the University of Kentucky College of Agriculture[1], Kentucky farmers were underutilizing their crop and pasture land and much of the land which was being farmed was not being put to uses which could have provided the greatest returns to farmers.

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[1] Agricultural Potentials for Kentucky, University of Kentucky College of Agriculture, 1977; prepared for the Governor's Council for Agriculture.

By assigning Kentucky's most productive soils to the production of crops that would yield the highest returns per acre, the study found that Kentucky farmers could triple their livestock (including beef) income, above feed costs. Additionally, using this formula of land utilization, the researchers found that alfalfa production could be increased 16-fold, soybean production by a factor of four, and corn production by a factor of three.

The study proposed that this increased production of alfalfa and corn be used to feed livestock raised in Kentucky and predicted that these increased feed supplies would permit Kentucky farmers to increase livestock numbers (as above), feed more hogs for slaughter, and sell a much higher percentage of the state's annual calf crop as yearlings or as finished cattle.

For fruits and vegetables, the study estimated that better utilization of land resources could increase Kentucky production of fruits, such as strawberries and grapes, by 830% and apples, peaches, cherries, pears, and plums by more than 300%. The study estimated that fresh vegetable production could be increased by more than 100% and processing vegetables by more than 500%.

Over the long-term, the schedule of better utilization of Kentucky's farmland, as outlined by the College of Agriculture in its study, would significantly reduce Kentucky's level of food imports as shown on the Chart. As cited in the study, this would increase Kentucky's total farm income to almost $4 billion or more than double the estimated 1980 total.

WHAT FOOD IMPORTS MEAN TO PUBLIC OFFICIALS

Providing an outline of the answer to the question about the number of new jobs which would result in Kentucky from increased food production is also difficult because the process by which food gets from the farmer to the consumer is complicated.

Our food system is comprised of a series of middlemen or "segments" between the farmer and the consumer which include warehousers, manufacturers and processors, wholesale and retail grocers, and restauranteurs which sell the finished products to us as consumers.

Although the model in Figure 1 below is a simple one, it shows the basic path of food from the farm to our tables.

Figure 1

COMPONENTS OF KENTUCKY FOOD SYSTEM

Component of Kentucky Food System			Employment[a]
	Agriculture Supplies and Services		66,255
	Farmer		53,000[b]
Farm Consumption	Sale	(Storage)	
	Wholesale		13,107
	Manufacturing and Processing		20,257
	Retail Grocers		34,147
	Restaurants		57,973
	Consumers		
Totals			244,677
Total Kentucky Employees			1,064,174
Food System Employment as % of total Kentucky employment			23%

Source:

a. County Business Patterns, 1980

b. 1978 Census of Agriculture (full time farmers).

As shown, farmers use land, labor, capital, and supplies and equipment to produce food. After harvest, the farmer has the option of eating, selling, or storing the food. If sold, the buyer will use the food for either domestic or foreign (export) consumption.

If a domestic wholesaler buys the crop, it is in turn sold to a manufacturer or processor, other wholesalers, or retail grocers or restauranteurs. The Chart shows that the consumer is the ultimate user of the farmer's crop.

The Chart also shows that 66,000 Kentuckians were employed providing goods and services to 53,000 full-time farmers, 13,000 worked in wholesale food-related jobs, 20,000 in food manufacturing and processing, 34,000 in retail grocering, and 58,000 in restaurants. Taken as a whole, our food system provides jobs for 245,000 Kentuckians.

Since Kentucky imports so much of its food, more than 245,000 people are employed in jobs related to feeding us. These additional jobs are located in the states from which we import our food and, in attempting to predict how many new Kentucky jobs would be generated by reducing Kentucky food imports, we are, in effect, estimating how many of these food-related jobs presently located in other states would come to Kentucky.

Since, as shown above, our food system is comprised of "segments", an estimate of the total number of new jobs which might result from reduction of food imports requires estimates for new jobs in each of the "segments" of our food system.

To do this, the relationships between the segments of the Kentucky food system must be established. For example, looking again at the Chart above, we see that approximately 66,000 Kentuckians were employed in 1980 providing goods and services to our state's 53,000 full-time and 50,000 part-time farmers. Using these goods and services, our 103,000 farms produced $1.7 billion worth of agricultural products.

If our farmers increased food production, as the College of Agriculture study suggested they could, the number of Kentuckians employed in providing goods and services to them, as well as those employed in the warehousing and manufacturing and processing segments of our food system, would also increase.

Determining the extent to which employment in Kentucky would increase as a result of increased production of food by Kentucky farmers, requires the use of a forecasting principal known as the "multiplier".

For example, through their studies economists have found that for each 10 new jobs in a clothing manufacturing plant located in a non-metropolitan county in Kentucky, two additional jobs are created in the community outside of the manufacturing plant. These two additional jobs in the community result from the increased demand for goods and services that the 10 new jobs in the plant generate. In this example, the economists say that the employment multiplier for the clothing manufacturing sector of the local economy is 1.2 (i.e., 1.2 x 10 new jobs in the plant = 12 new jobs in the community).

The Kentucky multiplier for agricultural production is estimated to be 1.3[2]. Using the same formula as above, this means that 10 new jobs on a farm in Kentucky would generate the need for three additional jobs in the sector of the local economy which provides goods and services to farmers.

[2] How New Local Industry Affects Employment of Rural Kentucky Residents, Smith, Infanger, and Stoll; for the Kentucky Development Cabinet.

The multipliers for the manufacturing and processing and for wholesaler sectors of our food system are estimated to be 2.57[3] and 1.58[2], respectively. This means for ten new food manufacturing, and processing jobs in Kentucky, 16 additional jobs would be created elsewhere within the state. Ten new jobs in the wholesale sector would generate eight additional jobs.

Using these multipliers, Figure 2 below shows that ten new jobs in each of these sectors of our food system would generate a total of 53 jobs.

Figure 2

FOOD SYSTEM

EMPLOYMENT MULTIPLIERS

Food System Sector	New Jobs		Multiplier		Add Jobs	Total New Jobs
Farm	10	x	1.3	=	(3)	13
Farm goods and sers.	10	x	2.5	=	(15)	25
Food mfg. and proc.	10	x	1.5	=	(5)	15
Totals	30				(23)	53

Economists have also found that a "multiplying" effect exists with respect to the incomes which are derived from various types of employment. These income multipliers work the same way as employment multipliers and are used to predict the economy-wide increases in income which result from increases in incomes in any one sector of an economy.

For example, economists estimate that the income multiplier for agricultural production is 1.93. This means that for each $1,000 of income in farm sector income, an additional $930 in income is generated elsewhere in the economy (i.e., $1,000 farm income x 1.90 = $1,930 total income).

[3] Interindustry Models for Rural Development, Oklahoma State University Experiment Station Technical Bulletin T139, 1974.

For income derived from food manufacturing and processing, economists estimate the multiplier to be 4.14[3]. This means that each $1,000 of income in that sector of a food system generates an additional $4,140 of income in the economy as a whole. Figure 3 below shows the impact of the income multiplier in our state food system.

Figure 3

INCOME MULTIPLIERS

Food System Sector	New Income		Multiplier		Add Income	Total New Income
Farm	$1,000	x	1.93	=	$ 930	$1,930
Food Mfg. & Proc.	$1,000	x	4.14	=	$4,140	$5,140
Totals	$2,000				$5,070	$7,070

To demonstrate the relationship between income multipliers and employment multipliers, the Extension Service in Indiana has estimated that each million dollars worth of agricultural production in Indiana generated about 100 new jobs there[4]. If this relationship between income and employment holds true for Kentucky, we can use it to estimate the number of new jobs which would result in Kentucky from increased food production and processing here.

Kentucky farmers received about $1.3 billion dollars in 1980 for their production of the foods shown on the Food Imports Chart. After a mark-up of about 25%, these foods sold at retail for about $1.7 billion. Assuming the same retail mark-up for our imported foods, plus 5% for transportation costs, we can estimate the farm value of our food imports to be about $1.26 billion.

By dividing this $1.26 billion by the Indiana ratio of value of agricultural production to jobs created ($1,000,000 in farm production = 100 new jobs) we can estimate that Kentucky's food imports represent 126,000 jobs!

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[4] Agriculture in Indiana's Economy, Purdue University Cooperative Extension Service.

(i.e., $1.26 billion in agricultural production divided by $1,000,000 = 1,260 x 100 jobs = 126,000 jobs).

Though tobacco's role in Kentucky agriculture may affect the degree to which an analogy between Indiana and Kentucky can be drawn, this estimate assumes that the Kentucky food system is basically similar to the Indiana system, and that Kentucky farmers can meet Kentuckian's demands for the foods listed on the Food Imports Chart.

Due to climatic conditions, Kentucky could probably never meet more than one quarter of its demand for fresh vegetables and this limitation might reduce the potential for new jobs by 10%.

SUMMARY

In 1980, 63% of the food which Kentuckians ate was grown in another state and imported to Kentucky.

For these imported foods, Kentuckians spent $1.8 billion in 1980, or almost $1,700 per household. Food imports to Kentucky amounted to about $17 million for each farm in our state in 1980.

Kentucky farmers could produce most of the foods we import by putting their land resources to better use. By doing so, they could double their annual incomes.

Greater food production in Kentucky could reduce retail food prices for Kentuckians by up to $90,000,000, create as many as 110,000 new jobs in our state, and generate up to $740,000,000 in new income.

These potential long-term benefits which our state might enjoy as a result of reduced food imports are significant. Our ability to reap these benefits depends to a large extent upon our agricultural resources which include land, labor, and capital.

The following section examines how these resources are used in Kentucky and how their utilization has been affected by trends within our nation's food system.

FOOD PRODUCTION IN KENTUCKY

Land is the primary component in our food system.

Out of a total land area of 26 million acres, Kentucky has about 5.4 million acres which are capable of producing crops. As shown in Figure 4 below, these croplands constitute roughly 21% of the total land area of our state.

Figure 1

MAJOR LAND USES

	Acres	%
Forestland	10,648,000	41.2
Pastureland	5,735,000	22.1
Cropland	5,428,000	21.0
Urban Land	2,338,784	9.0
Federal-owned	1,095,000	4.2
Water Areas	608,016	2.5
Total	25,852,800	100.0

Source: Kentucky Soil and Water Conservation Program; Kentucky Soil and Water Conservation Commission, January 1982, Frankfort, Kentucky.

The distribution of and extent of cropland (prime farmlands) within the five physiographic regions of Kentucky are shown in Figures 2 and 3. The distribution and extent of pastureland in these areas, which is used chiefly for the production of livestock, are also shown.

Figure 2

AGRICULTURE LAND USES BY RESOURCE AREAS

Acreage* Non-Federal-Rural Lands**

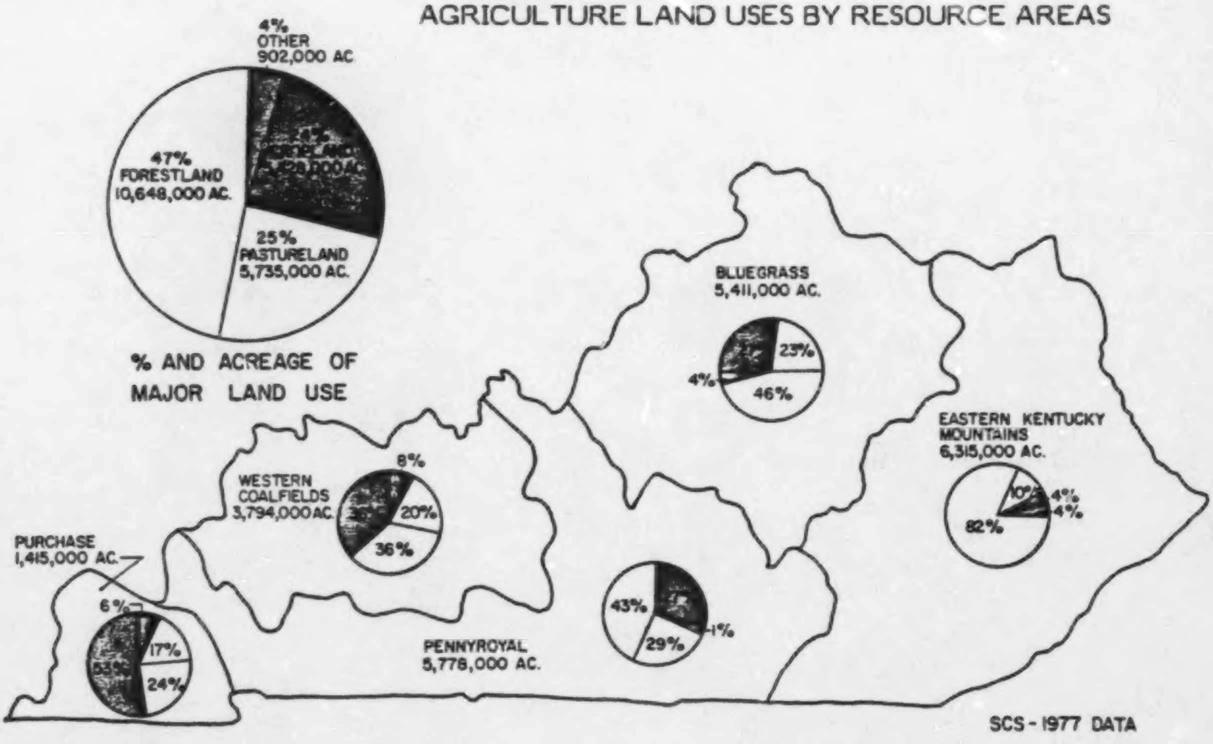
Land Resource Areas	Cropland	Pastureland	Forest	Other	Total
Purchase	746,000	243,000	336,000	90,000	1,415,000
Pennyroyal	1,572,000	1,675,000	2,464,000	67,000	5,778,000
Western Coalfields	1,382,000	753,000	1,380,000	279,000	3,794,000
Bluegrass	1,448,000	2,471,000	1,284,000	208,000	5,411,000
Eastern Ky. Mountains	280,000	593,000	5,184,000	258,000	6,315,000
State Total	5,428,000	5,735,000	10,648,000	902,000	22,713,000

**Base Data from SCS — 1977 National Resources Inventory.*
***Federal and Urban Lands (3,146,000 Acres) are* excluded.

Source: Kentucky Soil and Water Conservation Program

Figure 3

AGRICULTURE LAND USES BY RESOURCE AREAS

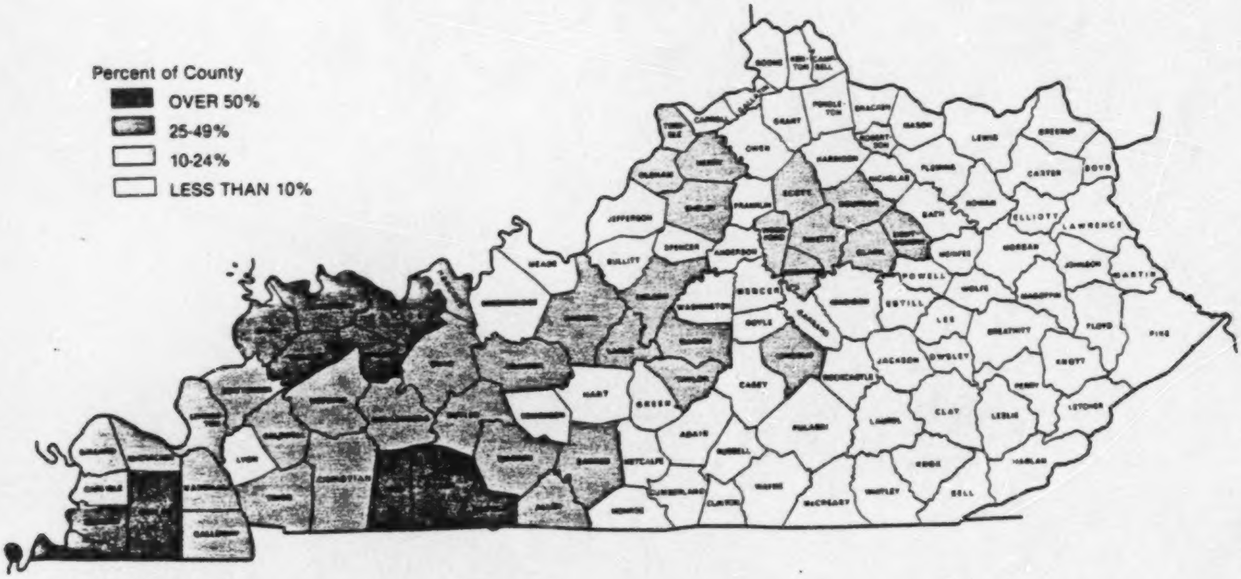

4% OTHER 902,000 AC
47% FORESTLAND 10,648,000 AC.
25% PASTURELAND 5,735,000 AC.
% AND ACREAGE OF MAJOR LAND USE
BLUEGRASS 5,411,000 AC.
23%
4%
46%
EASTERN KENTUCKY MOUNTAINS 6,315,000 AC.
10%
4%
4%
82%
WESTERN COALFIELDS 3,794,000 AC.
8%
20%
36%
PURCHASE 1,415,000 AC.
6%
17%
53%
24%
PENNYROYAL 5,778,000 AC.
43%
29%
1%
SCS - 1977 DATA

Source: Kentucky Soil and Water Conservation Program

The Prime Farmlands map (Figure 4) shows that most of our state's best farmland is located in the western and central portion of Kentucky. The darkest areas on the map have the greatest percentages of prime farmland.

Figure 4

KENTUCKY PRIME FARMLAND



Source: Kentucky Soil and Water Conservation Program

USE OF CROPLAND IN KENTUCKY

Among all producers in the United States, Kentucky ranks 1st in the production of tobacco and white corn; 4th in non-alfalfa hays; 6th in popcorn; 12th in soybeans; 14th in corn for grain and all other hays; 19th in winter wheat; 20th in sorghum for silage; 21st in barley; 26th in rye; 28th in alfalfa hay; and last in oats.

The land requirements for the "cash grains" (soybeans, corn, popcorn, wheat, barley, rye, and oats) amounted to 3.5 million acres in 1980.

Figure 5

KENTUCKY 1980 CROP SUMMARY - 1979 AND 1980[1]

CROPS	UNIT	Acres Harvested	
		1979	1980
		(1,000 Acres)	
Corn for grain	Bu.	1,300	1,480
Corn for silage	Ton	115	152
White Corn 2/	Bu.	72	110
Tobacco:			
All	Lbs.	173.7	200.9
Burley	Lbs.	156.0	185.0
Type 22, Fire	Lbs.	5.4	4.3
Type 23, Fire	Lbs.	4.2	3.9
One Sucker	Lbs.	5.5	5.5
Green River	Lbs.	2.6	2.2
Wheat	Bu.	290	350
Oats	Bu.	8	6
Barley	Bu.	25	29
Rye	Bu.	4	3
Soybeans for beans	Bu.	1,660	1,600
Sorghum for grain	Bu.	29	26
Hay:			
All	Ton	1,592	1,560
Alfalfa	Ton	204	200
All Other	Ton	1,390	1,360
Lespedeza Seed 3/	Lbs.	6.8	1.7
Red Clover Seed 3/	Lbs.	3.2	5.0
Orchardgrass Seed 3/	Lbs.	1.0	1.7
Tall Fescue Seed 3/	Lbs.	17.0	20.0
Popcorn 3/ 4/	Lbs.	10.0	20.0
Bell Peppers 5/ 7/	Cwt.	3.4	2.9
Fruits:			
Apples, Com'l 6/	Lbs.	--	--
Peaches 6/	Lbs.	--	--

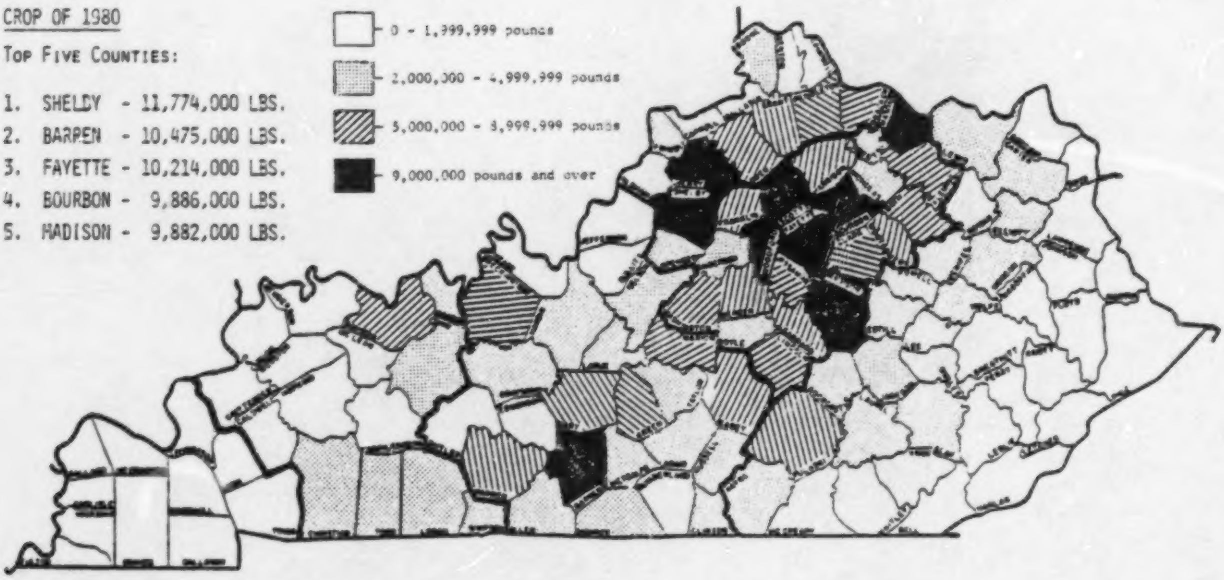
1/Preliminary 1980. 2/Included in Corn for grain. 3/Value per unit is for 100 pounds. 4/Shelled-corn basis. 5/Fresh market and processing. 6/Utilized production. 7/1980 value not reported to avoid disclosing individual operations.

Source: Kentucky Agricultural Statistics, 1980.

As shown in Figure 5, fifty-three percent of Kentucky prime farmland was devoted to the production of corn and soybeans alone. The following maps show that the majority of Kentucky's crop production comes from the western and central portions of the state. Their patterns reflect the distribution of prime farmlands in Kentucky as shown in Figure 5.

Figure 6

BURLEY TOBACCO PRODUCTION


0 - 1,999,999 pounds
2,000,000 - 4,999,999 pounds
5,000,000 - 8,999,999 pounds
9,000,000 pounds and over

CROP OF 1980

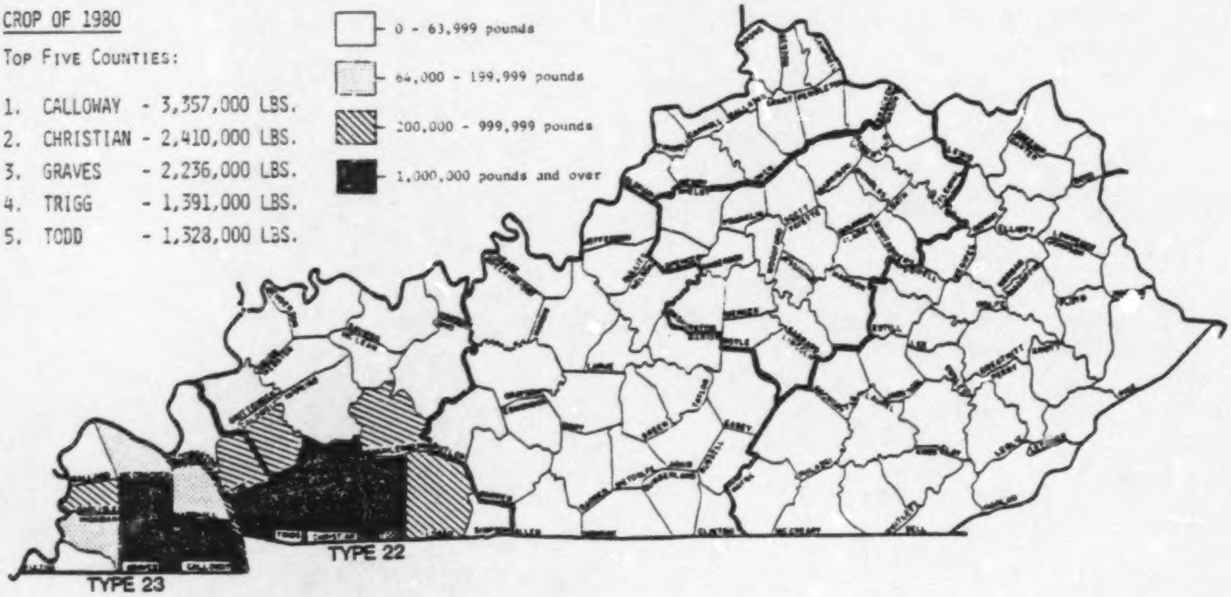
TOP FIVE COUNTIES:

1. SHELBY - 11,774,000 LBS.
2. BARREN - 10,475,000 LBS.
3. FAYETTE - 10,214,000 LBS.
4. BOURBON - 9,886,000 LBS.
5. MADISON - 9,882,000 LBS.

Source: Kentucky Agricultural Statistics, 1980.

Figure 7

DARK FIRE TOBACCO COUNTY ESTIMATES


0 - 63,999 pounds
64,000 - 199,999 pounds
200,000 - 999,999 pounds
1,000,000 pounds and over
TYPE 22
TYPE 23

CROP OF 1980

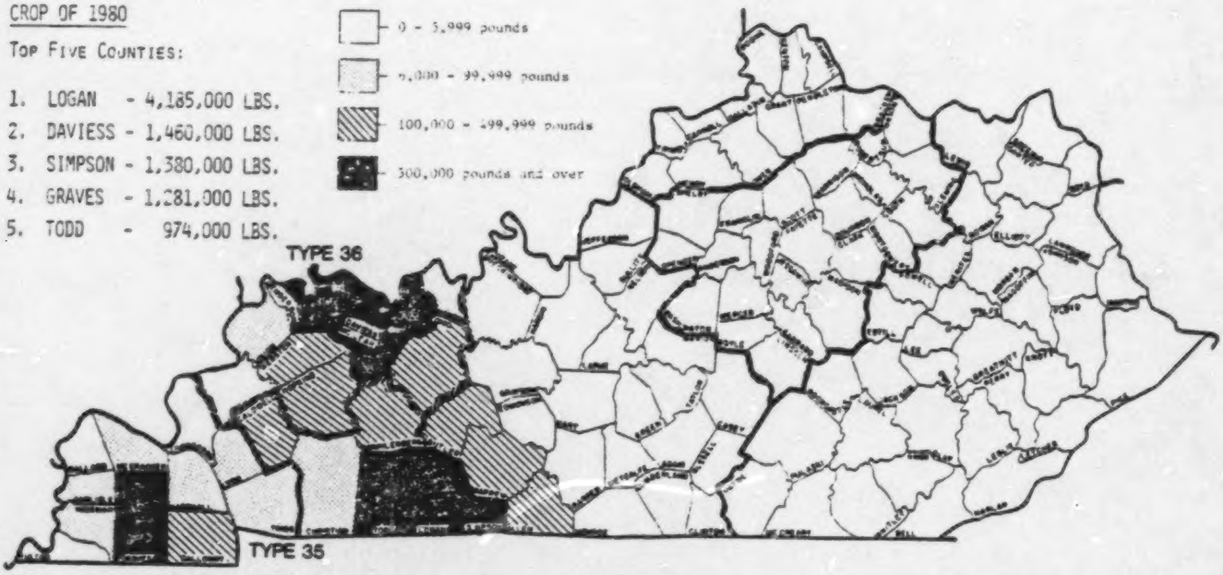
TOP FIVE COUNTIES:

1. CALLOWAY - 3,357,000 LBS.
2. CHRISTIAN - 2,410,000 LBS.
3. GRAVES - 2,236,000 LBS.
4. TRIGG - 1,391,000 LBS.
5. TODD - 1,328,000 LBS.

Source: Kentucky Agricultural Statistics, 1980.

Figure 8

DARK AIR-CURED TOBACCO PRODUCTION


0 - 5,999 pounds
6,000 - 99,999 pounds
100,000 - 499,999 pounds
500,000 pounds and over
TYPE 36
TYPE 35

CROP OF 1980

TOP FIVE COUNTIES:

1. LOGAN - 4,185,000 LBS.
2. DAVIESS - 1,460,000 LBS.
3. SIMPSON - 1,380,000 LBS.
4. GRAVES - 1,281,000 LBS.
5. TODD - 974,000 LBS.

Source: Kentucky Agricultural Statistics, 1980.

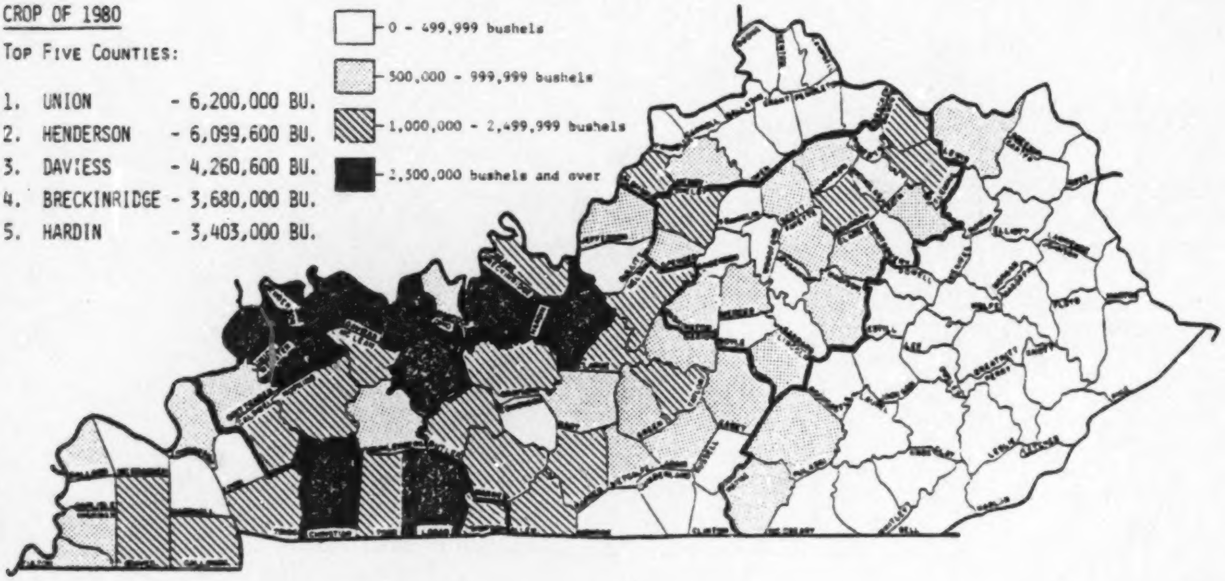
Figure 9

CORN FOR GRAIN PRODUCTION

CROP OF 1980

TOP FIVE COUNTIES:

1. UNION - 6,200,000 BU.
2. HENDERSON - 6,099,600 BU.
3. DAVIESS - 4,260,600 BU.
4. BRECKINRIDGE - 3,680,000 BU.
5. HARDIN - 3,403,000 BU.


0 - 499,999 bushels
500,000 - 999,999 bushels
1,000,000 - 2,499,999 bushels
2,500,000 bushels and over

Source: Kentucky Agricultural Statistics, 1980.

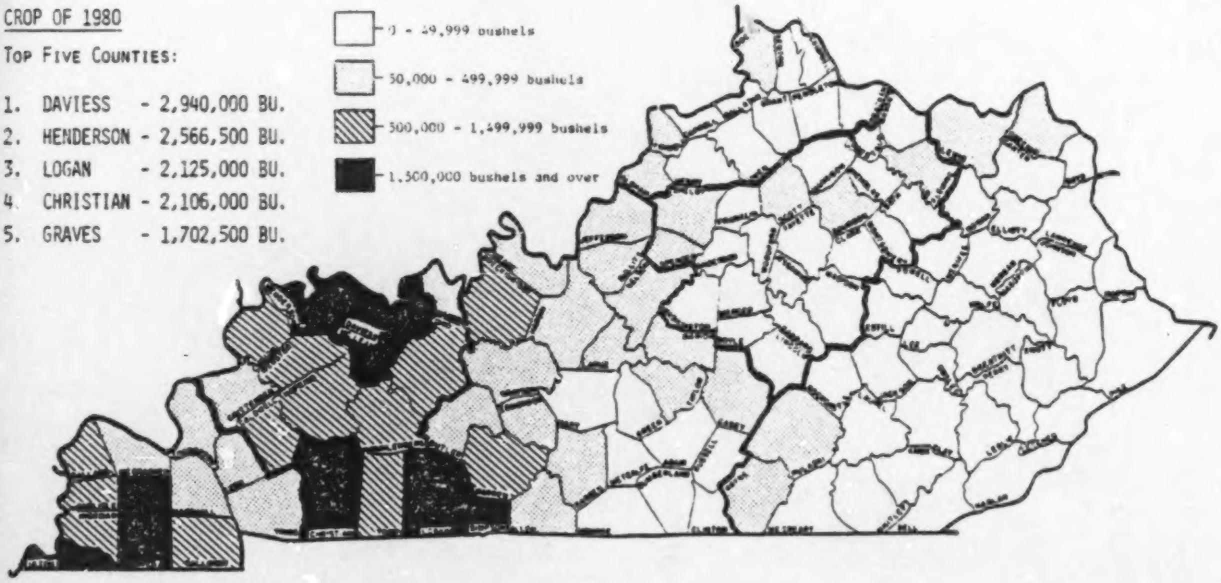
Figure 10

SOYBEAN PRODUCTION

CROP OF 1980

TOP FIVE COUNTIES:

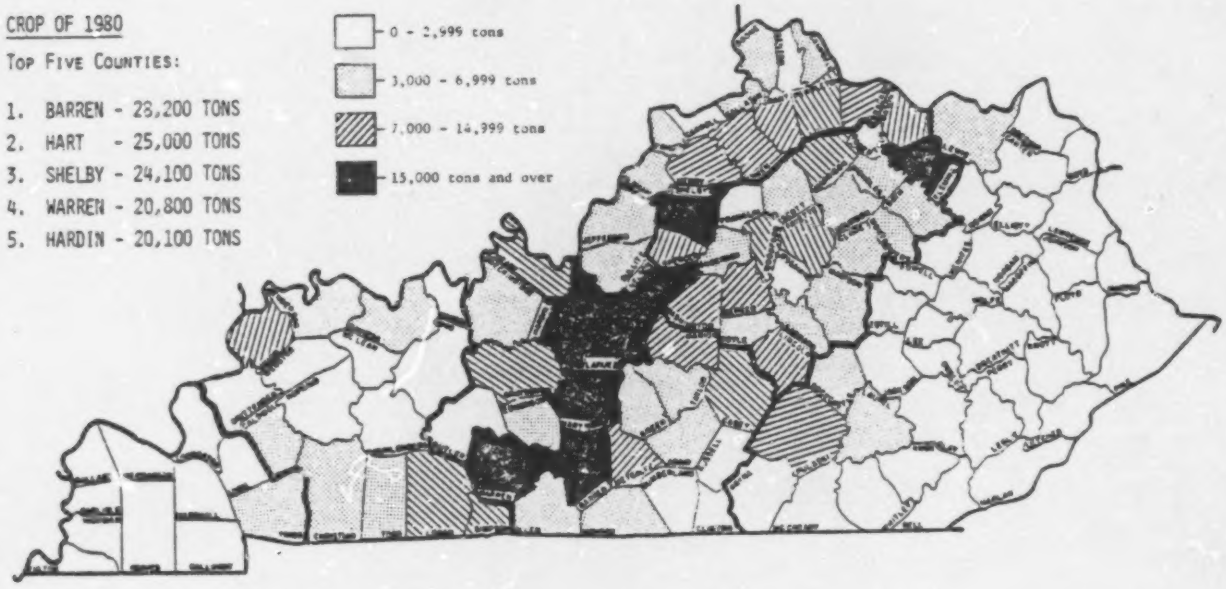
1. DAVIESS - 2,940,000 BU.
2. HENDERSON - 2,566,500 BU.
3. LOGAN - 2,125,000 BU.
4. CHRISTIAN - 2,106,000 BU.
5. GRAVES - 1,702,500 BU.


0 - 49,999 bushels
50,000 - 499,999 bushels
500,000 - 1,499,999 bushels
1,500,000 bushels and over

Source: Kentucky Agricultural Statistics, 1980.

Figure 11

ALFALFA HAY PRODUCTION



CROP OF 1980

Top Five Counties:

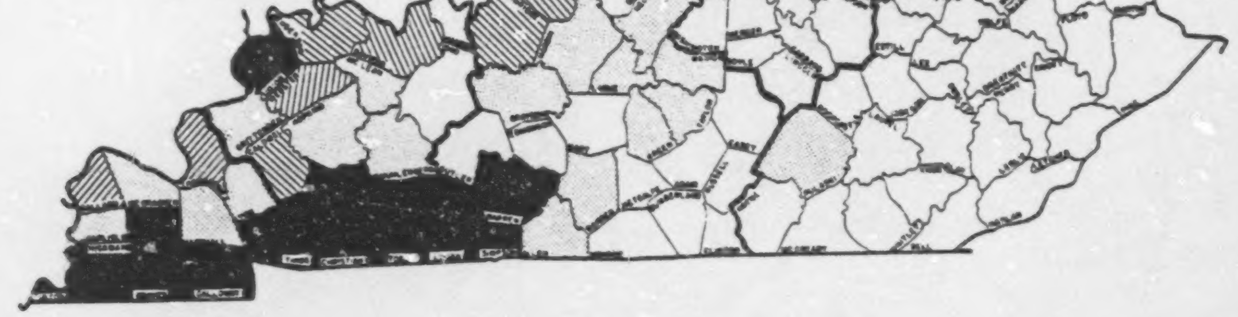
1. BARREN - 28,200 TONS
2. HART - 25,000 TONS
3. SHELBY - 24,100 TONS
4. WARREN - 20,800 TONS
5. HARDIN - 20,100 TONS

0 - 2,999 tons
3,000 - 6,999 tons
7,000 - 14,999 tons
15,000 tons and over

Source: Kentucky Agricultural Statistics, 1980.

Figure 12

WINTER WHEAT PRODUCTION



CROP OF 1980

Top Five Counties:

1. CHRISTIAN - 1,548,000 BU.
2. SIMPSON - 1,147,500 BU.
3. LOGAN - 968,000 BU.
4. CALLOWAY - 840,000 BU.
5. TODD - 594,500 BU.

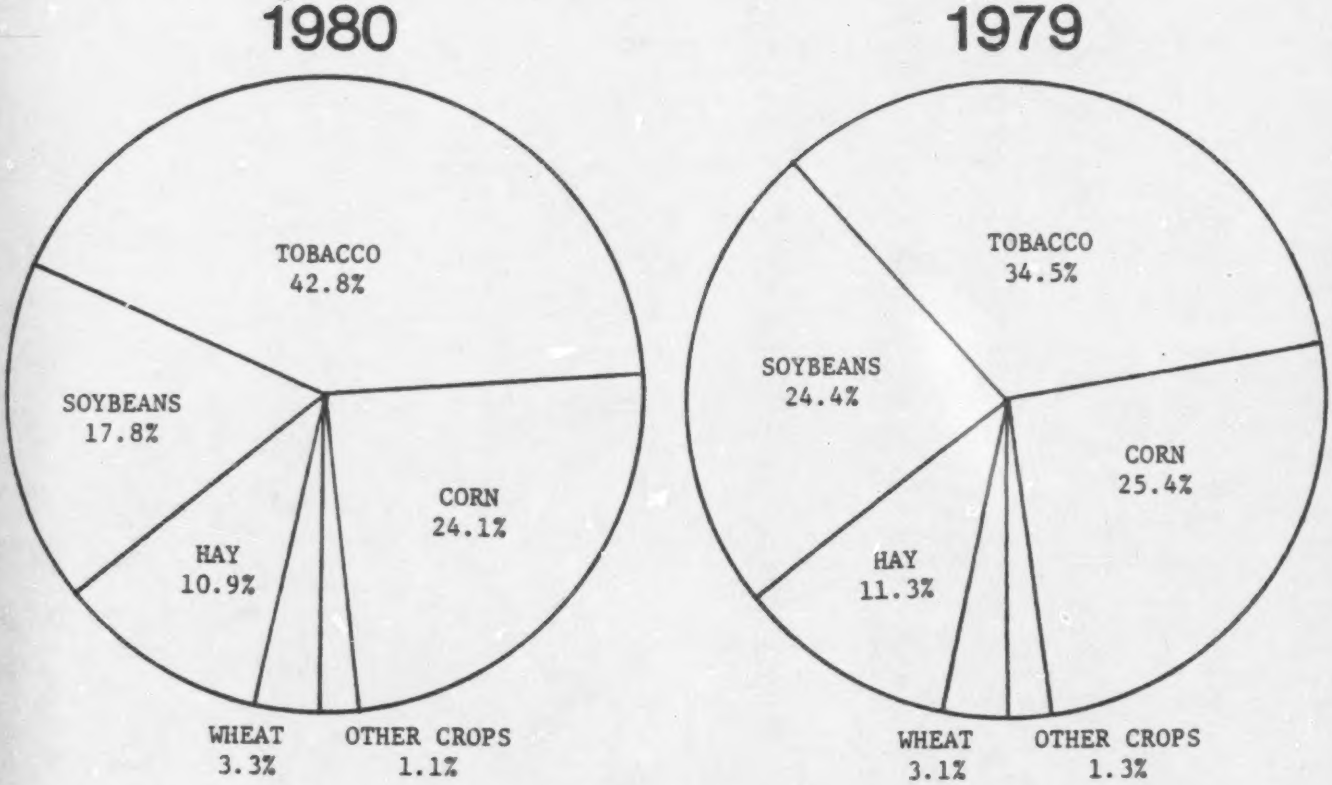
0 - 49,999 bushels
50,000 - 199,999 bushels
200,000 - 399,999 bushels
400,000 bushels and over

Source: Kentucky Agricultural Statistics, 1980.

Kentucky's five major crops (tobacco, corn, soybeans, hay, and wheat) accounted for 99% of the total value of all crops produced in the State in 1980. As shown in Figure 13 below, tobacco continued to be the leading crop in 1980 with 43% of the total crops value, followed by corn (24%), soybeans (18%), hogs (11%), wheat (3%), and other crops (1%).

Figure 13

DISTRIBUTION OF CROP VALUES



Source: Kentucky Agricultural Statistics, 1980.

USE OF PASTURE LAND IN KENTUCKY

As shown in Figure 1, Kentucky has approximately 5.7 million acres of land which, due to soil characteristics and topography, is best suited for use as pasture. These lands are chiefly used for grazing of livestock and are shown on Figure 4 as the lightly shaded area.

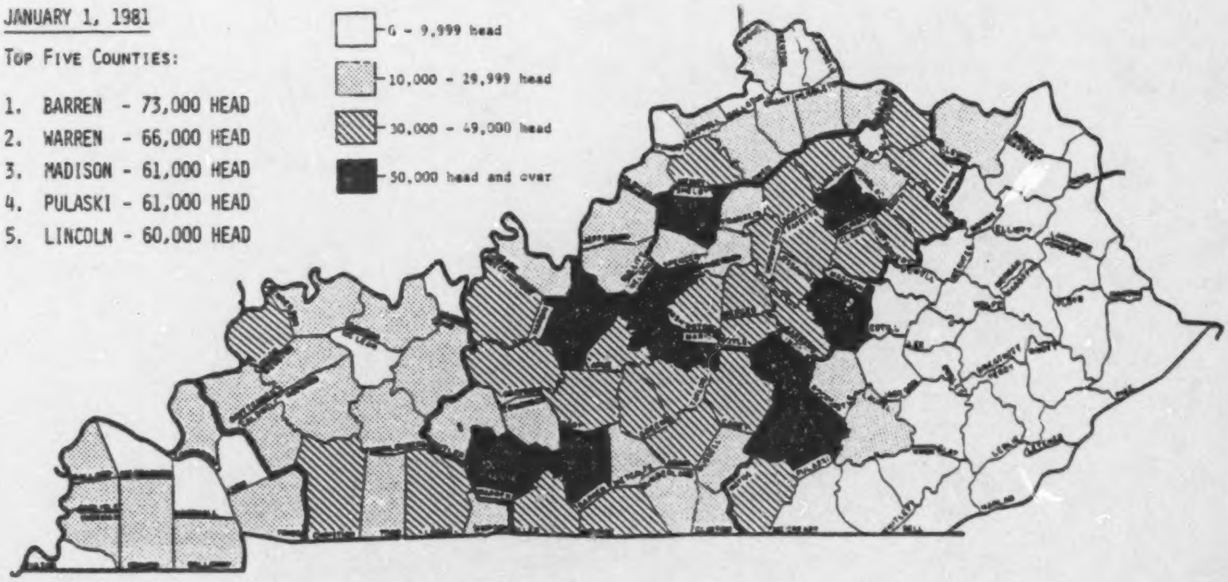
In livestock for slaughter, Kentucky ranks 11th among 43 states for hogs, 19th of 40 for sheep and lambs, 27th of 43 for cattle; 30th of 40 for calves.

In total head of production, Kentucky ranks 11th of 50 for beef and milk cows; 13th of 50 for all hogs; 14th of 50 for all cattle and calves; and 31st of 41 for all sheep and lambs.

Figures 14 through 17 show the areas of the state where livestock production is concentrated.

Figure 14

CATTLE AND CALVES



JANUARY 1, 1981

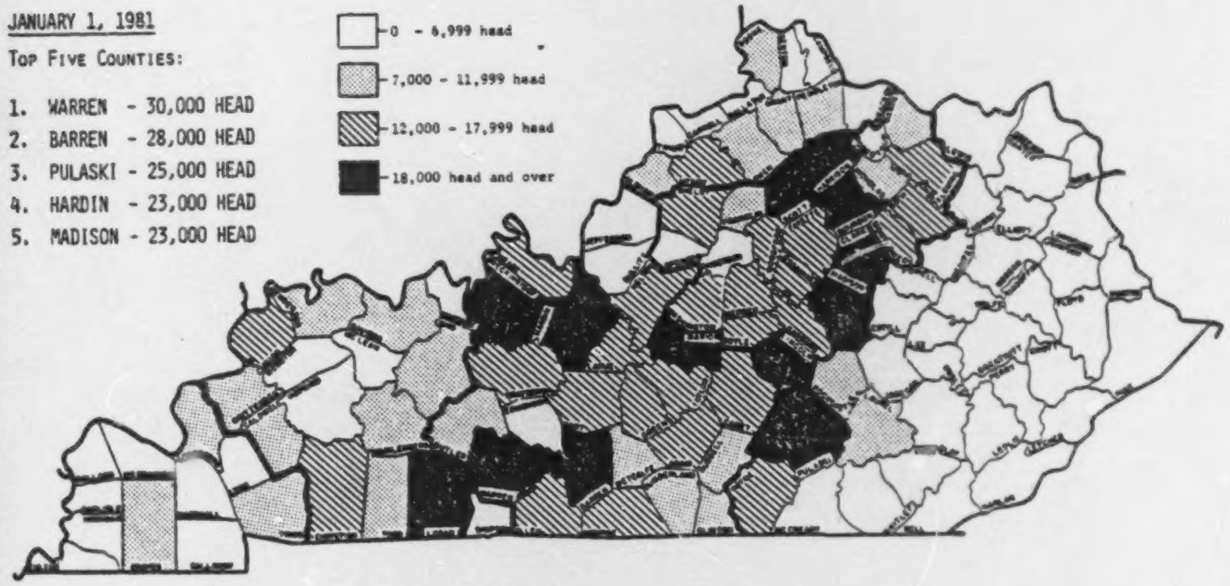
TOP FIVE COUNTIES:

1. BARREN - 73,000 HEAD
2. WARREN - 66,000 HEAD
3. MADISON - 61,000 HEAD
4. PULASKI - 61,000 HEAD
5. LINCOLN - 60,000 HEAD

Source: Kentucky Agricultural Statistics, 1980.

Figure 15

BEEF COWS



0 - 6,999 head
7,000 - 11,999 head
12,000 - 17,999 head
18,000 head and over

JANUARY 1, 1981

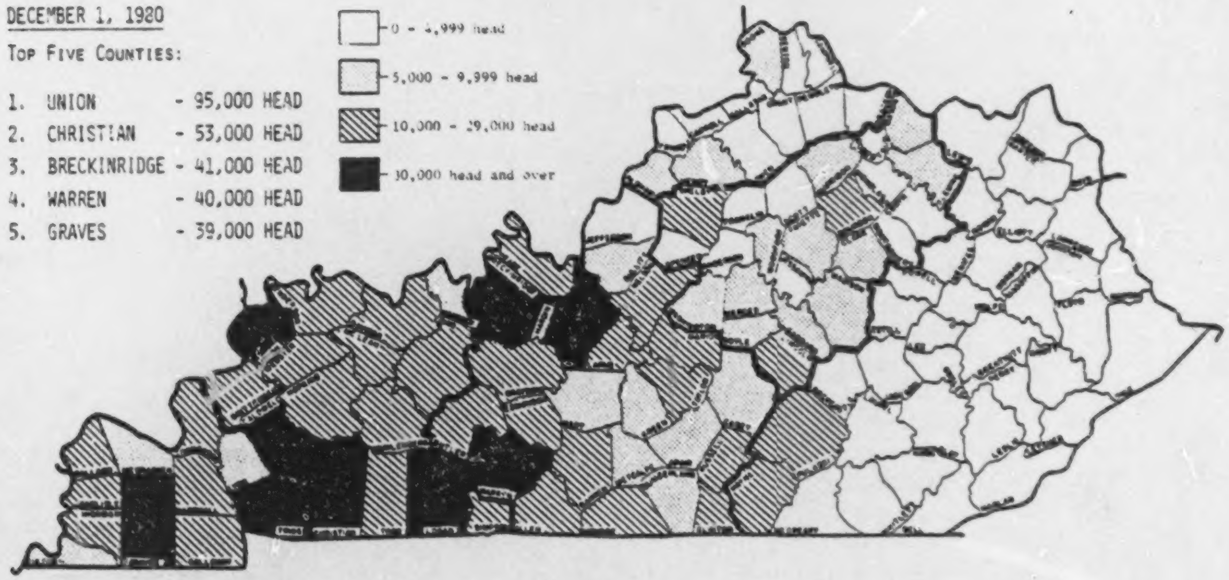
TOP FIVE COUNTIES:

1. WARREN - 30,000 HEAD
2. BARREN - 28,000 HEAD
3. PULASKI - 25,000 HEAD
4. HARDIN - 23,000 HEAD
5. MADISON - 23,000 HEAD

Source: Kentucky Agricultural Statistics, 1980.

Figure 16

HOGS AND PIGS



0 - 4,999 head
5,000 - 9,999 head
10,000 - 29,000 head
30,000 head and over

DECEMBER 1, 1980

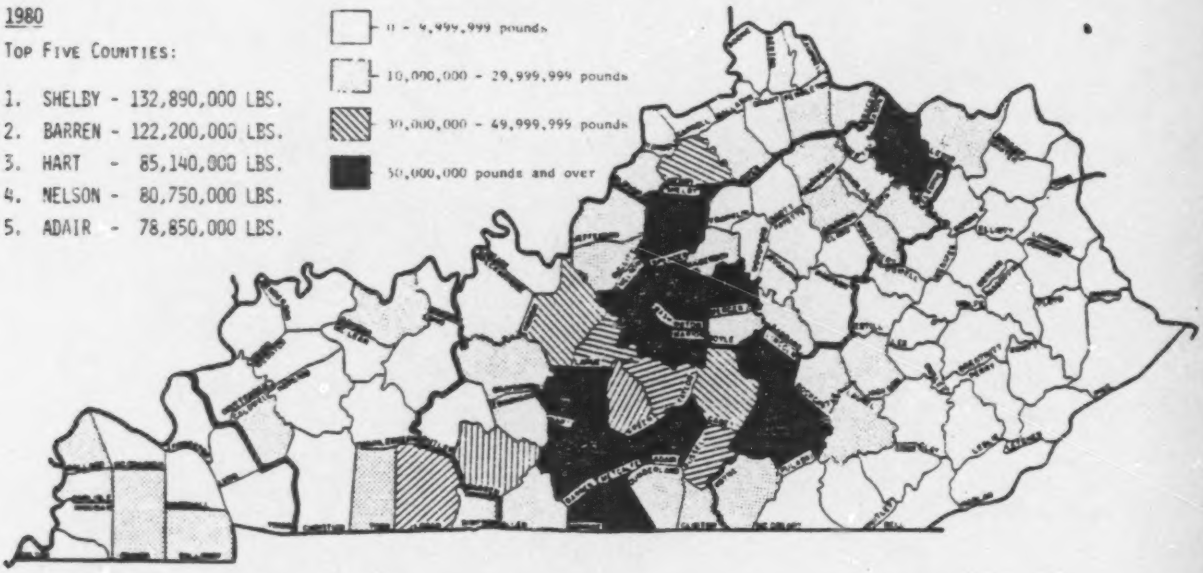
TOP FIVE COUNTIES:

1. UNION - 95,000 HEAD
2. CHRISTIAN - 53,000 HEAD
3. BRECKINRIDGE - 41,000 HEAD
4. WARREN - 40,000 HEAD
5. GRAVES - 39,000 HEAD

Source: Kentucky Agricultural Statistics, 1980.

Figure 17

MILK PRODUCTION


0 - 9,999,999 pounds
10,000,000 - 29,999,999 pounds
30,000,000 - 49,999,999 pounds
50,000,000 pounds and over

1980

Top Five Counties:

1. SHELBY - 132,890,000 LBS.
2. BARREN - 122,200,000 LBS.
3. HART - 85,140,000 LBS.
4. NELSON - 80,750,000 LBS.
5. ADAIR - 78,850,000 LBS.

Source: Kentucky Agricultural Statistics, 1980.

TOTAL FARM PRODUCTION

The leading farm products in Kentucky, by their percent of total value of farm production, are shown below.

Figure 18

LEADING FARM PRODUCTS IN KENTUCKY

	% of Total Production
Tobacco	23.6
Cattle/calves	18.0
Corn	14.3
Soybeans	10.5
Dairy	7.8
Hogs	6.5
Wheat	2.0
Poultry/eggs	1.0
Fruits (non-citrus)	0.2
Vegetables	0.1
	insignificant
	84.0

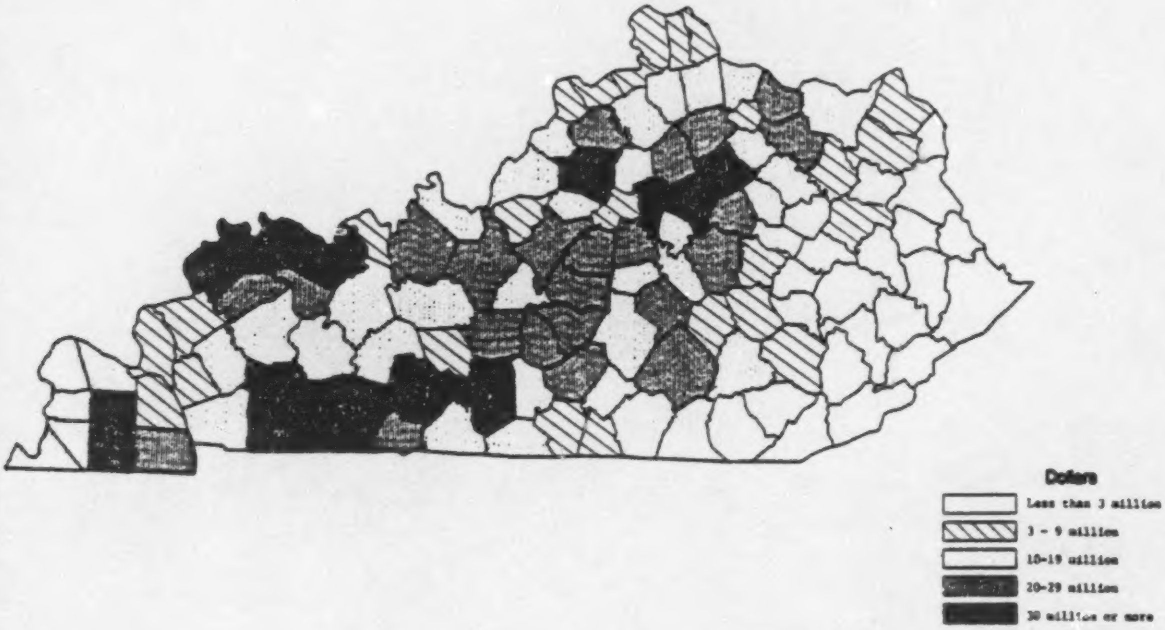
Source: Determinants of Regional Food Security

Figure 19 shows the total value of all agricultural products sold from each Kentucky county in 1980. The darkest counties had the greatest total farm income from crops and livestock production in Kentucky in 1978.

Statewide, crops accounted for approximately 50%, and livestock about 35%, of the total value of all agricultural production in 1980.

Figure 19

VALUE OF AGRICULTURAL PRODUCTS SOLD BY COUNTY: 1978.


Dollars
Less than 3 million
3 - 9 million
10-19 million
20-29 million
30 million or more

Source: Census of Agriculture, Kentucky, 1978.

Exports

Figure 20 shows that exports of Kentucky farm products amount to 23% of total production in 1980.

Figure 20

KENTUCKY'S EXPORTS -- SELECTED COMMODITIES

	Kentucky's share of U.S. exports -%-	Exports as a % of Kentucky's Production
All Commodities	1.4	22.6
Feed Grains	1.4	5.7
Wheat & Flour	0.6	1.8
Soybeans & Products	2.0	6.0
Animal Products	1.7	2.0

Source: Determinants of Regional Food Security

With the exception of tobacco, these exports constitute a minor portion of total American production (Figure 21).

Figure 21

KENTUCKY'S SHARE OF U. S. PRODUCTION

	% of U. S. Production
Tobacco	23.4
Cattle/Calves	1.9
Corn	1.8
Soybeans	2.0
Dairy	1.7
Hogs	2.0
Wheat	0.6
Poultry/Eggs	0.3
Fruits (non-citrus)	insignificant
Vegetables	insignificant
Potatoes	insignificant

Source: Determinants of Regional Food Security

On the most superficial level, it might be said that we import 63% of our foods because the best farmland in Kentucky is used for the production of export products such as tobacco, corn, and soybeans.

However, this explanation, suggesting as it does that agriculture in Kentucky is an entity to itself, ignores the significant national changes which have occurred in agriculture since WW II and the impacts these changes have had upon farming in Kentucky. As technology, population shifts, and changes in public attitudes have caused agriculture in the U. S. to change, so have they caused agriculture in Kentucky to change.

TECHNOLOGY

Advances in technology, including the development of disease resistant seed varieties, pesticides and herbicides, fertilizers, and farm equipment, have enabled the U. S. farmer to produce more food than we eat.

This surplus allows us to put food on our tables more cheaply than in any other nation in the world. This surplus also makes exports of farm products to another country or state crucial to the farmer.

As food surpluses grew and prices fell, farmers specialized their operations to reduce their production costs. Areas of the nation with unique combinations of soil and climate began to nationally market their specialties more cheaply than local producers could. California's predominance in the vegetable market, Wisconsin's in dairy products, and Florida's in citrus fruits, are examples of this trend toward specialization in which transportation and increased energy use are very important.

As farming areas ceased to compete for a special market, the production know-how and the infrastructure for transportation and marketing, storage, and processing for that specialty, disappeared, further reducing the area's ability to compete in the market place.

Specialization, with its requirements for large tracts of land and expensive, single purpose equipment, has turned farming into agri-businesses in which the availability and cost of credit are important factors in farm profit. And farmers, like all other sectors of the U. S. economy, have been hurt by high energy costs, high interest rates, and inflation.

POPULATION SHIFTS

While the trend toward specialization was developing, the Post WW II baby boom began to affect the types and prices of land resources available to the U. S. farmer.

The automobile, another product of technology, made it possible for our growing population to work in the city and live in the suburbs. As the suburbs grew, urban sprawl increased the price of farmland surrounding the cities to reflect the profits which could be made in using farmland for urban uses rather than for farming.

Since urban development is most profitable when it occurs on flat land with deep, well-drained soil, the U. S. has lost a great deal of its prime farmland for urban uses in the last 30 years. Current estimates put the national rate of conversion of farmland to non-agricultural uses at 3 to 5 million acres per year.

This reduced access to prime farmland near our urban centers has contributed to soil erosion because in many areas of the nation the only land which farmers can afford to farm is less well suited for cultivation than prime farmland. Since less than prime farmland is more susceptible to erosion due to its slope and other characteristics, its use for cultivation is a major factor in America's growing soil erosion problem.

The food surplus referred to earlier also contributes to soil erosion. When food prices are low, farmers often increase their production to achieve the income which a higher price would have provided. Because the land is worked harder and more often, its productivity depends greatly upon the soil conservation practices, such as terracing and rotation. These additional operations, which increase production expenses, are sometimes foregone by farmers. This begins a vicious cycle in which farmland is worked harder for an increasingly diminishing return until the land is unprofitable for use.

PUBLIC ATTITUDES

Agriculture's reliance upon technology and transportation, and its difficulty in competing for the sources it needs to produce our food, are reflected in major changes in public attitudes in our modern society.

The increasing competition for food producing land for other uses is due, in part, to our movement from the rural to the urban areas of our nation where employment opportunities were more numerous.

The development of specialization in agriculture parallels the evolution of the assembly line in modern manufacturing in which each worker performs only one of the many tasks required to produce a finished product.

As we became an urban nation, our familial connection with the farm diminished. In our pursuit of a higher standard of living, convenience and leisure have become increasingly important. This is reflected in census figures which show that more Americans now work in restaurants than on farms.

As our disposable incomes have grown, we can afford the price of fresh vegetables or fruits in February. As a result, the supermarket has replaced the farmer as our source of food.

Supermarkets, by themselves, represent a vast system of wholesalers, warehouses, handlers, processors, packagers, transporters, and advertisers, and reflect the growing interconnectedness and complexity of our food system in which the farmer has become only one of the actors.

This relationship between the farmer and the other actors within our nation's food system was documented by the U. S. Department of Agriculture in its 1980 report entitled, "A Time to Choose".

Among its most significant findings, the report estimated that 25% of total U. S. farm production is controlled, or vertically integrated, through either outright ownership or contract. This estimate was based upon the

Department's research which showed that 74% of all the food manufacturing assets in the U. S. are controlled by 50 companies; that only 22% of the farms in the U. S. generated 81% of total farm sales; and that 54% of all the farmland in the U. S. is controlled by 7% of the "farmers".

The report also concluded that the policies of the federal government have contributed to the trend toward concentration in the U. S. food system. In support of this conclusion, the report cited the fact that the largest 10% of U. S. farms received 46% of all the money expended by the federal government through its many farm programs.

These changes in American agriculture have affected farming in Kentucky. Their impacts are most clearly seen in the change in the number of farms, and the distribution of farm incomes, in Kentucky during the last 35 years.

FARMS IN KENTUCKY

In 1980 there were 103,000 farms in Kentucky with sales of $1,000 or more. Figure 22 below shows that this number compares with an estimated 238,000 such farms in 1945. During this 35-year period, the size of the average Kentucky farm increased from 83 acres to over 143 acres in size.

Figure 22

FARMS IN KENTUCKY 1945 - 1980[a]

	1945	1950	1959	1969	1974	1978	1980[1]
Total Farms	238,000	218,000	150,000	125,000	102,000	109,000	103,000
Land in Farms (million acres)	19	19	17	16	14.5	15	14.6
% of Total Land in Farms	77	76	66	63	57	60	5.7
Average Size of Farms (acres)	83	89	113	128	141	137	143

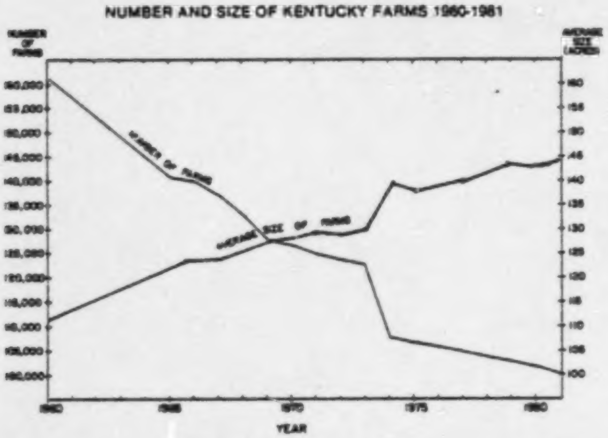
[a] 1978 Census of Agriculture

[1] Kentucky Agricultural Statistics, 1980 (preliminary)

Figure 23 below shows the changes in these numbers between 1960 and 1980.

Figure 23

NUMBER AND SIZE OF KENTUCKY FARMS 1960 - 1980



Source: Kentucky Soil and Water Conservation Program

Figures 22 and 23 reflect the national trend toward larger equipment, rising production costs, and reduced availability of farm labor, which have pushed out smaller sized farms, and created fewer farms with larger acreage.

Figure 24 shows the shift in number and size of Kentucky farms between 1969 and 1978 by number of farms by land per farm and the number of farms by economic class. During this period the number of Kentucky farms 1,000 acres or more in size increased by 22% and Kentucky farms with production of $100,000 or more increased by 566%.

Figure 24

BI-MODAL DISTRIBUTION OF FARMS IN KENTUCKY

	1969	1978	Percent change 1978/1969
All Farms	124,990	109,900	-12.07
Average Farm Size	129	137	+6.2
Number by Land-per-Farm			
*1,000 acres or more	740	900	+21.6
*Less than 50 acres	40,700	38,400	-5.7
All others	83,550	70,600	-15.5
Number by Economic Class			
*$100,000 +	390	2,600	+566
*$5,000-$20,000	29,900	40,200	+34.4
*All others	94,700	67,100	-29.1

Source: Determinants of Regional Food Security

SUMMARY

Kentucky has 6 million acres of land which is uniquely suited for the production of food via cultivation. Most of this cropland is located in the western and central portions of our state. Half of this land is used to produce cash grain (corn and soybeans) for export.

Our state has a nearly equal amount of land which is best suited for livestock production, most of which is exported to other states for finishing.

Tobacco, cash grains, and livestock each account for about one-quarter of total farm income in Kentucky. Exports of agricultural products amounted to about 23% of total farm income in 1980.

There were 103,000 farms in Kentucky in 1980 with sales of $1,000 or more. This represents a 57% decline in the number of farms in Kentucky over the post WW II period. While the number of Kentucky farms has been declining, the farms that remain are bigger, now averaging 143 acres. This growth is parallelled by a 566% increase in the number of Kentucky farms which produced $100,000 or more in farm products.

This trend toward fewer and bigger farms in Kentucky reflects the effects of increased reliance upon technology and specialization in agriculture nationally, and the movement of Americans from rural to urban areas and changes in public attitudes.

THE KENTUCKY CORNUCOPIA PROJECT

The objective of the Kentucky Cornucopia Project is to draw attention to our state's dependence upon others to feed ourselves. The Project's chief findings suggest that the economic rewards of reducing food imports to Kentucky would be significant for our state.

Foremost among the Project's findings are:

- Kentucky imported 63% of its food in 1980 and $1.8 billion left our economy to pay for it;
- Food imports to Kentucky in 1980 amounted to $511 per capita or about $17,000,000 per Kentucky farm;
- Transportation costs for our imported foods in 1980 were $90,000,000;
- Kentucky food imports represent 110,000 jobs or over $740,000,000 in employment income;
- Kentucky could produce most of the food imported in 1980.

WHAT WE CAN DO

The quickest way for Kentucky to reduce its dependence upon others for food would be for every Kentucky family to grow its own food. Since it is estimated that 43% of all U. S. households had gardens in 1980, and that each produced an average of 588 pounds of food, this idea does not seem too far-fetched[1].

But, given our demonstrated desire for convenience and leisure, it seems more likely that our farmers will play the key role in reducing our level of food imports. Because of this, it is to them, and to our public officials, that the Cornucopia Project's recommendations are directed.

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[1] Gardens for All, National Garden Survey 1980-81, the National Association for Gardening, Burlington, Vermont.

"CAPTURE THE MARKET"

Our food imports represent a market which is currently being met, and enjoyed, by food system actors located in other states. Reductions of our level of food imports implies that those out of state actors would be replaced by actors located in Kentucky.

In simple terms, the "take-over" of our import market by Kentucky requires three things.

First, our farmers must be willing to produce the food which we are currently importing. Second, our farmers must be able to sell their new products to processors, manufacturers, and grocers, so that they are available to us as consumers. Third, consumers must believe that Kentucky grown foods are as good a buy or better than those grown elsewhere and demonstrate their belief by buying them.

In one respect, this equation is much like the chicken- or-the-egg proposition. No one can expect our farmers to invest their land, labor, and capital to produce products which they are not certain they can sell. By the same token, Kentucky consumers cannot buy foods which are not made available to them.

This impasse is due to lack of "middlemen" in our food system. These warehousers, processors, manufacturers, and wholesalers, are vital links in the food system and their relative absence in Kentucky is a major factor in our need to import foods.

To strengthen this weak link in our food system, and to reap the potential rewards of doing so, Kentucky should employ the economic development techniques it has used throughout the last 20 years to attract other industries to our state.

The attraction of food processing and manufacturing businesses to Kentucky would create a market for food products which our farmers are not currently producing. They would also provide wholesale and retail grocers with a convenient supply of locally grown foods which could be sold at lower prices than imported foods.

As part of this program, the Commonwealth could also finance low interest loans to help farmers with the capital expenses they will incur in "retooling" to meet the food market these new middlemen would create.

If restricted to farms located within Kentucky's agricultural districts, this low interest loan program would also provide a significant counter-incentive to the conversion of productive Kentucky farmland to non-agricultural purposes.

In tandem with this program, the government of the state of Kentucky could begin to purchase locally grown foods.

In 1980, the state Parks system purchased over $2.4 million worth of food. Food purchases by other agencies of state government, not including the eight public universities, amounted to more than $2.3 million. Assuming that purchases of food by the universities exceeded the combined total for the Parks and other agencies, state government itself represents a $10 million market for our food producers. Any portion of this amount which local producers were able to capture would generate new jobs and additional income here in Kentucky.

Our state's Colleges of Agriculture also have an important role to play in the reduction of food imports to Kentucky. Though their resources have always been limited, over the years research and extension programs have greatly improved farm productivity and profitability in Kentucky.

These programs will become even more important if, as the federal tobacco program continues to undergo change, Kentucky farmers find it necessary to grow other or additional crops.

As indicated by its 24% share of total farm income in Kentucky, tobacco is our number one cash crop. Any significant change in the tobacco market would have wide ranging economic, and cultural, impacts which extension and research would be called upon to mitigate. Their ability to provide reliable information and technical assistance on the production of new crops could be crucial to the continued existence of the "small farmer" in Kentucky.

Even with a commitment by our farmers, public officials, and institutions to the specific recommendations for action which follow, our dependence upon others will not be reversed overnight.

As a parallel to the saying that "we are what we eat", it can be said that our food system works the way it does because we, as consumers, allow it to. Viewed as a polling booth, the checkout counter tallies our votes for the status quo every time we purchase foods which could have been, but were not, produced in Kentucky.

Ultimately, greater food production by Kentuckians for Kentuckians will come about because we, as consumers, let it be known that this is what we want. Generally, we can do this in three ways.

First, when purchasing food at the supermarket, we can ask our grocer where it came from. If it is not Kentucky grown, we can ask him to stock locally grown foods, or more of them if he is already doing this. Even if he cannot get what we want specifically, he may be able to locate some other Kentucky grown food and, because of our interest, decide to stock it rather than an import. In either event, our inquiries about Kentucky foods will make an impression on him and, if he is interested in his business, he will try to respond to our requests.

Second, we can buy foods at farmers markets and road-side stands operated by farmers. There are over 300 of these direct farmer to consumer outlets across Kentucky. Because they are direct, the foods sold are more nutritious and cheaper than those sold in supermarkets.

An additional benefit of buying foods at farmers markets is the person to person contact it provides. This interaction helps to bridge the gap, now filled by the supermarkets, which separates the food producer from the food consumer. Through these direct meetings, we can let our farmers know that we want them to produce more of the foods we eat and that we will buy them if they will grow them.

Third, we can let our elected and appointed officials know that we want them to initiate policies and programs to increase food production in Kentucky.

Though they may not be able to directly influence food production, their decisions on contracts for food purchases by public agencies, or on the location of highways or other economic development projects in prime farmland areas, or on annexations and subdivision developments, all indirectly affect farming and food production potential in Kentucky.

The recommendations which follow are not all inclusive, but they are specific enough to begin the process of change toward greater food production in Kentucky. The Cornucopia Project welcomes other suggestions.

RECOMMENDATIONS

RECOMMENDATIONS TO CONSUMERS

1. Become more active in your food system. Increase your awareness of what foods are locally produced and which are transported in from other areas of the country. Know the nutritional quality of the food you consume. Share information with friends, neighbors, and supermarket and grocery store personnel.

2. Form a local Cornucopia Project consisting of people who want to work at changing some aspect of their food system. Possible activities include establishing home and community gardens, bartering, cooperative food buying, storing and preserving, setting up food banks, and gleaning from harvested fields.

3. Purchase locally-grown fruits and vegetables in season, taking advantage of their peak nutritional value and decreased cost. You can also process these foods and store them for cold weather months to eliminate higher commercially processed and packages food prices.

4. Support your local farmers by purchasing food directly from growers, thereby increasing their needed financial support while enjoying fresh, nutritious foods at reasonable prices. Start food co-ops and for additional savings, contract with farmers in the region to produce some of your food.

5. Change your eating habits to improve and maintain your health by consuming less fat, salt, sugar, and cholesterol while increasing fiber and vegetable protein intake.

6. Start a home garden to produce more of your own fruits and vegetables. Community gardens provide a greater selection of produce when the harvest is shared with cooperating gardeners. They offer access to land for those (especially urban residents) who might otherwise be unable to garden.

7. Extend your growing season by building solar grown-frames and/or utilizing container gardening.

8. Starting a land trust which could purchase critical agricultural properties as they come on the market, resell them with deed

restrictions to new farm owners, or transfer them to other appropriate trusts or to the city, county, or state at some future time. A land trust is a non-profit corporation which is able to own real property or interest in real property. It is one way to offer permanent protection to selective farming areas within local communities.

RECOMMENDATIONS TO FARMERS

I. Farmland Preservation

1. Take advantage of existing laws. Farmers should become better informed about specific state and local laws which can benefit them. These include: current use value assessment, forming agricultural districts and receiving eligibility for preferential valuation of agricultural land for inheritance taxes.
2. Learn about the diversity of technical assistance and services available to farmers through local conservancies and land trusts, which can show them the best options for the future use of their land, including areas which are not essential to farm production. This kind of planning service would help farmers realize certain economic benefits while still maintaining and preserving their farm operation.
3. Preserve farmland by markedly decreasing soil erosion. Your local soil conservation district will provide you with assistance in developing or updating a soil and water conservation management program, suggesting strategies to build the soil and reduce the need for increasingly costly fertilizer inputs.
4. Reduce soil losses through combinations of structural and management practices, such as conservation tillage, cropland terraces and

diversions, contour farming, the use of crop residues, winter cover crops, and hedges.

5. Take land that is severely eroding out of production.

6. Use marginal lands for grazing livestock instead of crop production.

7. Have soils tested accurately to determine the nutrient value of the soil and its fertilizer needs in order to prevent overuse of costly, energy-intensive fertilizers. Beware of inaccurate soil testing services.

II. Farm Inputs/Resources

1. Diversify production with selected combinations or rotations of crops or an interplay of crops with livestock. This practice would reduce fertilizer and weed control costs while providing the farmer with greater market stability.

2. Diversify production regarding not only types of crops but individual strains of a single crop so as to reduce the risk of farm pests blighting the entire crop.

3. Reduce energy use by investing in more fuel-efficient machinery, looking into solar dryers, letting crops dry naturally whenever possible, adding insulation where feasible, and taking advantage of natural lighting in farm buildings. Investigate possibilities for using alternative energy sources, whether this be the conversion of manure into methane or the use of solar heat for crop drying and other on-farm energy requirements.

4. When dealing with different soil types in large fields, consider reducing field size for maximum ecosystem diversity. This would establish a healthier ecosystem which can vary greatly in one large field.

5. Consider using management practices that will reduce the need for chemical fertilizers, pesticides, and other expensive inputs.

6. Develop on-farm fertilizer sources by growing nitrogen-fixing legumes and green manure crops.

7. Utilize marginal land in combination with more productive soils and proper management to maintain more cattle, thereby increasing beef and organic fertilizer production.

8. Avoid routine spray schedules. Apply pesticies only when needed and target spraying to delay the onset of insect resistance, reduce undesirable residues, do minimal damage to beneficial insects, and decrease costs.

9. Consider alternatives to pesticide use and/or reduction. Thee could be: integrated pest management involving monitoring pest levels for proper timing of applications, no-tillage, crop rotations and interplanting, narrow rows, or broadcast seeding to establish a canopy sooner than with wide row spacing, and biological control of pests to maintain the natural ecosystem.

III. Marketing/Economics

1. Organize marketing co-ops to provide restaurants, schools, and other institutions with locally-grown produce.

2. Work cooperatively with the consumer by selling directly to the public. This will ensure a higher price for the farmer's goods and fresher produce for the consumer at a lower cost.

3. Locate marketing centers strategically for the assembly, grading, packing, and distribution of the output from many small producers thereby providing large buyers with the volumes and specifications they require.

4. Consider small-scale processing on the farm such as processing sausage, cured meats, pickles, preserves, cheeses, etc. Fresh produce can be washed, sorted and packaged for sale to restaurants and markets. Dried beans, nuts, and seeds as well as honey can be sold to food stores and restaurants.

5. Investigate before planting what specific varieties of crops purchasers wish to buy by surveying bulk food purchasers in your area.

6. Sharpen marketing skills by examining price movements to forecast supply and demand. De-emphasize concentration on farm production while allowing time to think, plan, read and analyze the current market so as to obtain a better price for agricultural products.

7. Extend the availability of some produce by staggering planting and harvesting dates between the last frost date of the spring and first frost date of the fall and by selecting varieties with varying periods of maturation.

8. Begin to work towards changing grading and marketing standards that reflect the nutritious quality of the crop rather than its uniformity and appearance.

9. Seek to reduce debt to manageable levels.

10. Encourage local newspapers, if a section is not already provided, to devote columns to farm problems and listing of local/seasonal food availability.

RECOMMENDATIONS TO LOCAL GOVERNMENTS

1. Aid and encourage local food production and distribution by instituting a department to regulate and protect agricultural land use,

encourage urban and rural food production, develop urban markets for local produce, initiate educational programs, and create plans to meet normal and emergency local food needs through local production and storage.

2. Identify the long- and short-term costs to the city before converting any prime farmland to development use.

3. Develop and encourage local food production by:

    a. Establishing city-run gardens in low income areas, and/or providing seeds, tools, and technical assistance on gardening to those receiving food stamps and other kinds of food assistance.

    b. Providing funds to establish gardens and/or greenhouses and subsidizing gardens to schools, prisons, hospitals, and nursing homes.

    c. Establishing community farms on urban fringes to be worked by local farmers or interested city residents.

    d. Promoting contract growing whereby groups of urban families, co-ops, or the city itself arranges to purchase food directly from a local supplier.

    e. Developing loan funds for food self-reliance projects, such as greenhouses, food preservation and storage operations, and small businesses associated with urban agriculture.

    f. Establishing urban agricultural testing programs with the state Cooperative Extension Service to test crop varieties, analyze soil for nutrients and pollutants, test crops for pollutant residues, prepare demonstration sites for various types of urban agriculture and waste recycling, and offer technical assistance on farming as well as design and construction of community greenhouses, cold frames, rooftop gardens, etc.

   - g. Encouraging local industries which produce low grade waste heat to make use of this energy by producing food in attached greenhouses.
   - h. Requiring garden areas in new multiple unit housing projects.
   - i. Making certain that urban street tree programs preserve solar access for food production.

4. Develop and encourage local markets by:
   - a. Establishing farmers' markets in the city, particularly in low income neighborhoods, and facilitating authorizations for farmers to accept food stamps at the markets.
   - b. Creating mobile farmers' markets and/or fish markets to visit housing projects, neighborhood centers, factories, and universities.
   - c. Assisting in the formation of food cooperatives, co-op stores, and preservation/storage centers.

5. Develop and encourage local food processing and storage by sponsoring community food preserving facilities where residents use this service free or at a low cost and/or providing incentives to grocery stores to establish food preserving facilities for their shoppers.

6. Facilitate access to food by implementing a "food hotline" to provide referrals for emergency food, food stamps, and meals for elderly.

7. Create a greater understanding of the importance of agriculture to urban areas through educational programs. Offer seminars in urban agriculture, aquaculture, container and rooftop gardening, food preservation, storage preparation, and nutrition.

8. Establish food banks in your area to store and distribute surplus food.

9. Have county institutions purchase their food supplies from local farmers.

10. Preserve the remaining farmland in the vicinity by creating agricultural open-space preserves to retain prime farmland for agricultural use.

11. Set aside areas for recycling facilities.

12. Investigate land use techniques like clustering, performance controls, and transfer of development rights which would give farmers greater options to develop either on the farm or in other areas within the community or region.

13. Establish an Agricultural Development Council to focus on generating economic solutions to the problems of farmland loss in the counties. These local agricultural development councils would be comprised of people from the entire food system in the county and include farmers, processors, distributors, store managers, and farm service equipment dealers, as well as realtors and bankers. The council could develop local markets for local producers. It could survey local producers to see which ones would grow produce for local consumption and survey local stores, restaurants, and institutions to encourage them to purchase more locally grown foodstuffs. The council could also determine where local food is coming from and could promote more consumption of local foodstuffs.

14. In addition to enforcing the soil erosion and sedimentation control measures, pass local ordinances similar to the one in Sterling,

Wisconsin, which is successfully conserving all agricultural lands over one acre in size with a slope greater than six percent.

15. Undertake joint cooperative agreements, Memorandums of Understanding -- as currently being carried out in Lancaster County, Pennsylvania -- which allow the local conservation district board to review subdivision plans for adequacy of erosion sedimentation control and stormwater management, and give it permission to inspect earthmoving activities to ensure implementation of erosion and sedimentation control practices.

16. Investigate the agricultural Land Evaluation and Site Assessment (LESA) system being developed by the Soil Conservation Service and the U. S. Department of Agriculture. The program will assist planners in identifying farmland that should be protected based on land capability, soil productivity, soil potentials, and important farmland rating.

RECOMMENDATIONS TO THE STATE

1. Promote agricultural production within Kentucky and in nearby states by:
    a. Offering incentives for farmers to diversify production, utilizing technical assistance from extension agents and low-interest state-guaranteed loans to make changes necessary for diversification.
    b. Mandating a study by the Department of Agriculture and University of Kentucky College of Agriculture investigating the potential for producing various crops needed in the state.

c. Establishing demonstration experiments to test crop, animal, and fish varieties suitable to our soil and climate as well as developing low-input sustainable farming techniques.

d. Providing tax incentives for small-scale food producers, such as not taxing the first $10,000 of income from food produced for local consumption.

e. Issuing state tax credits for home and farm production, processing, and storing of food.

f. Encouraging new farmers through loans and incentives to enter into certain types of farming operations, those which would maintain the optimal balance of farm types in the state. (See Research Recommendations #1).

g. Initiating a program like New England's Small Farm Management Assistance Program to provide practical farm management skills to small-scale commercial farmers on a one-to-one basis.

h. Organizing a farmer linkage program whereby experienced farmers bring prospective farmers into their operation easing the transfer of land ownership over time. In this way the new farmer would be more successful in avoiding costly farming mistakes while gaining the tenured operator's knowledge of the farm.

i. Expanding programs such as the Livestock Products Marketing Program to encourage Kentucky farmers to produce these commodities and consumers to purchase them.

2. Preserve remaining farmland in the state by:

   a. Publishing guidelines to help local governments protect agricultural land and enhance farming. These guidelines could include ways to prevent "leapfrog" or random development, which removes from production not only the land that has been developed, but which in the long run isolates adjacent farming areas and inhibits certain farming activities. The state could also delineate ways whereby municipalities could best protect farmland in urban fringe areas, and it could prepare guidelines for different kinds of farmland preservation strategies and techniques including agricultural zoning, transfer of development rights, purchase of development rights, community land trusts, performance zoning. It could prepare procedures which would help local governments assess the different kinds of strategies that would be most appropriate and feasible for them, given the extent of farming in the area, development pressures, commitment of farming community to remain in agriculture, existing and potential land use, economic characteristics, natural features, and attitudes of local residents towards preserving farmland.

   b. Mapping all farmland that the state believes should be protected from development, identifying all Class I and II soils that are crucial to the agricultural capabilities of the state. (The state of California has been engaged in mapping all of its farmland for the last few years in order to identify those areas that are important to the state for agricultural production.)

c. Instituting a farmland capital gains tax in ways which would discourage speculators from investing in farmland, and selling it for development.

d. Creating a committee to inventory and monitor all state-owned farmland and assess its productive capability while working to ensure that this land remains in farming.

e. Consider including a "right of first refusal" amendment to the Kentucky Agricultural Districting Act. The "right of first refusal" or preemption option is currently used in France, where owners of farmland within designated areas must by law notify a state-chartered nonprofit corporation of their intention to sell their land. The corporation has the right to buy the farmland within 30 days.

f. Encouraging municipalities to work together through joint municipal planning by working together to enact and adopt joint municipal comprehensive plans and joint municipal zoning ordinances. This would be one way to achieve agricultural zoning on a more regional basis, which could anticipate many of the current challenges to its constitutionality.

g. Passage of legislation which would record agricultural land transfers on an annual basis.

h. Reducing the capital gains tax for those farmers who sell farmland to young, beginning farmers, especially if farmland is sold at less than full market value.

i. Keeping a yearly record of how effective current farmland preservation legislation has been. Periodic analysis of the

Agricultural Districts Program should be conducted to explain why or why not the legislation is successful and whether or not amendments to the legislation are needed.

3. Stop or decrease the loss of our topsoil by:

   a. Enforcing existing anti-erosion laws by establishing new penalties for erosion damage. This owuld involve prohibiting all agricultural production activities which result in more soil loss per acre per year than the maximum soil regenerative capability in Kentucky.

   b. Linking economic programs, such as loans, crop insurance, disaster relief, and state purchase of farm commodities, to the avoidance of excessive soil erosion.

   c. Instituting and enforcing a "severance tax" on soil losses due to excessive erosion to finance subsidies, to encourage conservation practices, and to pay for downstream dredging of silt, damage to water treatment facilities, and other social costs.

   d. Establishing rewards for soil enrichment, such as tax credits for on-farm soil and water conservation programs, including contour tillage, minimum tillage, and crop rotation. Using public subsidies, such as low-interest loans, preferential farm property tax formulas and valuations, and other tax incentives to encourage cover and permanent cropping, minimum tillage, ridge planting, proper rotation, longer rotations, biological nitrogen fixation, contour plowing, terracing, stripcropping, leaving harvest residues on soil surfaces, reducing soil compaction and salinity, intercropping, and regional organic waste recycling.

   e. Developing incentives for encouraging the use of rental arrangements which include provisions for sharing erosion control and soil enrichment costs with the landowner.

   f. Developing public awareness programs to promote understanding of the need to support sound soil conservation practices.

4. Expand local markets by:

   a. Establishing more farmers' markets and organizing wholesale farmers' markets to supply retailers, consumer co-ops, and other volume purchasers.

   b. Increasing promotional efforts for direct purchase of food from farmers by supermarkets, restaurants, schools, hospitals, and other institutions.

   c. Encouraging existing processing plants to purchase locally-grown products.

   d. Developing linkages between large-volume food buyers and Kentucky producers.

   e. Giving preference to in-state producers in bidding for the sale of foods by permitting state institutions to purchase foodstuffs directly from local farmers and in-state producers at prices at or in excess of the lowest submitted bid according to a percentage to be determined by the state. This is done by the state of Maine.

   f. Providing assistance to small growers through a statewide marketing clearinghouse.

g. Assessing the viability of implementing marketing alternatives in Kentucky to determine price and maintain market access for individual farmers through electronic commodity markets, vertical coordination through forward contracting, forward deliverable contract markets, and mandatory public reporting of market information. Other options include exclusive agency bargaining, vertical integration through ownership, joint ventures between agricultural cooperatives and agribusiness-marketing firms, marketing orders, and marketing boards.

h. Establishing regional livestock marketing committees to evaluate alternatives such as regional market centers owned and operated by either a local or a regional cooperative, a regional electronic sales exchange, and contract sales to packers, while providing for more direct movement from producer to slaughterer thereby decreasing costs.

5. Strengthen in-state food-processing capabilities by:

a. Providing incentives for existing food companies to develop more energy-efficient processing and packaging techniques, along with incentives to attract new food processors who wish to reduce transportation costs by locating near a major distribution center.

b. Helping to establish community food processing and storage facilities for the use of families and small commercial food producers. In this way, economies in equipment and energy consumption can be realized.

   c. Providing incentives for on-farm processing, cooling, and fresh packing of local food crops.

6. Effect a transition from depletable to renewable energy sources by conducting regional inventories of all renewable energy sources and providing incentives, such as tax credits or low-interest loans for investments made in agricultural energy conservation and on-site development of renewable energy sources, or tax exemptions for income received from the production of renewable energy.

7. Recycle organic wastes to utilize their full potential by:

   a. Preparing a statewide inventory of the types and amounts of organic wastes available now and in the future and assess the ability of these wastes to improve soil fertility and tilth and their potential energy use.

   b. Developing incentives for using local organic wastes for fertilizer and incentives to industry to separate toxic substances from their wastes so that they might be more safely used on cropland.

8. Enact a bill which requires returnable bottles and the recycling of metal cans. This would reduce materials consumption in the food system.

9. Protect the natural environment by enforcing existing environmental protection laws, developing programs for safer handling of toxic pesticides and stronger enforcement of laws against pesticide misuse, and developing stricter standards for pesticide residues in foods. Collect data on pesticide use in Kentucky.

10. Develop long-range food system plans by:

a. Revising and improving the methods by which crops and livestock production data are gathered so that the future direction of the state's agriculture situation is determined based on accurate, reliable information.

b. Creating an overall state food policy which will increase regional self-reliance and economic viability while decreasing the vulnerability of the state's food supply.

c. Planning for an emergency food supply disruption by strengthening our grain storage facilities capacity.

d. Conducting an annual study of the condition of the state food system to find out the amount of food currently being imported and exported, soil erosion losses, amount of land lost to development, and other food system issues while stating what Kentucky can do to increase its self-reliance.

11. Instill a greater understanding of agriculture's role in all Commonwealth citizens by:

a. Increasing awareness of seasonal, locally-grown produce, and its nutritional and economic benefits.

b. Initiating educational programs on farmland preservation, farm energy conservation, reduced pesticide and fertilizer use, recycling of organic wastes, and energy expenditures in different methods of farming and home food production and preparation.

c. Promoting nutrition education campaigns illustrating the relationships between diet and health and the benefits of fresh, locally-grown, and minimally processed foods, as well as bulk purchasing of food.

d. Communicating goals and the condition of our food supply as revealed in the state's annual study.

RECOMMENDATIONS TO THE FOOD INDUSTRY

1. Encourage sustainable farming methods by using the food industry's influence on farm production techniques to decrease the use of dangerous pesticides and increase the use of soil conservation measures. De-emphasize produce appearance while concentrating on freshness and nutritional quality.
2. Minimize energy and material use by using less processing (and/or more efficient methods), simpler packaging, and rail networks more often in transporting commodities.
3. Move toward regionalizing food purchasing, processing, and distribution, thereby decreasing transport costs and strengthening the local economy with increased use of local labor.
4. Promote the consumption of fresh, locally-produced food in season, enhancing consumer nutrition and building a stronger local economy.
5. Provide nutrition education, hints for food preparation, and techniques on preserving fruits and vegetables.
6. Focus on food in a holistic way, recognizing that diet is an essential component of a healthy life and is influential in preventing as well as treating illness.
7. Grocery stores should purchase and label for consumers Kentucky produce. Point-of-purchase literature could be made available to consumers to make them aware of where food originates and the issues involved with this.

RECOMMENDATIONS TO THE AGRICULTURAL RESEARCH COMMUNITY

1. Determine the optimal mix of farm types in Kentucky to obtain sustainable yields of both crops and livestock to meet the state's consumption needs and to provide a sufficient level of exports. Determine the production needed to support processing plants for various commodities. If the commodity is produced in quantities sufficient to make a processing plant economically competitive, this would be an incentive for establishing those businesses in state.
2. Assess relationships between biofuels development (including forest resources) and long-term soil productivity to provide guidelines for future programs.
3. Investigate how to improve the capability of using forage and Kentucky crop wastes.
4. Begin a small-scale-agriculture research program at the University of Kentucky College of Agriculture. This will not only aid small-scale enterprises, but will also help large-scale farms diversify and become less dependent upon a single commodity. Efforts along this line will help meet local food needs and keep Kentucky farmland in production.
    a. There is a need for smaller equipment which would use less energy and decrease the amount of soil compaction and erosion, at a cost that small operators can afford.
    b. Continue and expand research on fruits and vegetables and post-harvest handling methods to benefit small-scale producers.
5. Work to develop plants which resist pests and mature earlier so less drying is required.

6. Investigate Kentucky's soil erosion problems, looking at crop residues, run-off, tillage practices, rotation systems, terraces, equipment use, etc.

7. Investigate perennial agricultural systems (permaculture) appropriate to Kentucky to eliminate annual soil disturbance and decrease energy, fertilizer, pesticide, and herbicide usage.

8. Determine the long-term effects of recommended applications of chemical fertilizers, pesticides, and herbicides on the productivity of selected Kentucky soils.

9. Investigate methods to utilize Kentucky municipal wastes in agriculture.

10. Expand research on biological nitrogen fixation.

11. Develop crop varieties adaptable to low-input farming systems in Kentucky.

12. Explore the potential of small-scale aquaculture in Kentucky to provide high-quality protein using cost-efficient and ecologically sound methods.

13. Set up plots to study the transition phase of switching from conventional to low-input farming systems.

14. Examine methods for producing food in cities, e.g., rooftop food production systems. Seek ways to make urban food distribution and marketing systems more accessible to local and regional food producers.

15. Develop more energy-efficient food processing, storing, and distribution techniques.

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1980 KENTUCKY FOOD IMPORTS[a]

	KENTUCKY FOOD PRODUCTION[b]		KENTUCKY FOOD CONSUMPTION[c]		KENTUCKY IMPORTS[d]		KENTUCKY EXPORTS[e]		LAND REQUIREMENT[f]
FOOD ITEM	RETAIL WEIGHT 1000 lbs	RETAIL VALUE $1,000	RETAIL WEIGHT 1,000 lbs	RETAIL VALUE $1,000	%	RETAIL VALUE $1,000	%	RETAIL VALUE $1,000	FOR KENTUCKY CONSUMPTION ACRES
MEATS									
BEEF	82,384.9	222,439.2	247,117.5	667,217.2	67	444,778.0			849,736.8
VEAL	91.0	245.7	5,492.5	14,828.4	99	14,582.7			
LAMB AND MUTTON	404.0	989.8	4,759.3	11,660.3	92	10,670.5			743.6
PORK	399,028.0	594,551.7	250,046.5	372,568.9			37	221,982.8	402,767.0
POULTRY									
CHICKEN	17,100.0	11,457.0	183,030.0	122,643.5	91	111,186.5			150,258.0
TURKEY	---	---	38,440.5	35,749.6	100	35,749.6			55,358.0
EGGS	69,679.9	33,446.3	126,670.6	60,801.8	45	27,355.5			80,650.0
FISH									
FRESH & FROZEN	65.0	145.6	28,921.9	64,785.0	99	64,639.4			1
CANNED	---	---	17,572.8	39,363.1	100	39,363.1			
DAIRY									
MILK	2,219,000.0	576,940.0	834,708.0	217,024.1			62	359,915.9	135,243.0
CHEESE[g]	59,499.0	132,682.7	80,908.1	180,425.1	27	47,742.4			129,697.0
BUTTER	13,873.0	27.329.8	16,108.4	31,733.5	14	4,403.7			54,483.0
ICE CREAM	44,651.2	41,525.6	63,335.0	58,901.5	30	17,375.9			152,291.0
VEGETABLES, FRESH[h]									
POTATOES	37,500.0	6,900.0	177,480.0	32,656.3	79	25,756.3			7,099.2
LETTUCE	690.0	259.0	89,640.0	33,166.8	99	32,907.8			3,897.3
CABBAGE	6,300.0	1,890.0	30,240.0	9,072.0	79	7,182.0			1,440.0
TOMATOES	8,500.0	5,695.0	41,040.0	27,496.8	79	21,801.8			2,414.1
SWEET CORN	2,400.0	984.0	23,760.0	9,741.6	90	8,757.6			2,970.0
SNAP BEANS	1,000.0	690.0	4,680.0	3,229.2	79	2,539.2			1,170.0
ONIONS	1,500.0	480.5	36,720.0	11,383.2	95	10,902.7			1,184.5
CELERY	---	---	26,280.0	11,300.4	100	11,300.4			525.0
CARROTS	---	---	21,960.0	9,442.8	100	9,442.8			784.2
SWEET POTATOES	2,300.0	575.0	12,240.0	3,060.0	81	2,485.0			1,064.3
CUCUMBERS	11,000.0	5,060.0	16,108.4	7,409.9	32	2,349.9			1,440.0
PEAS	200.0	88.0	158.4	69.7			25	18.3	90.0
MUSHROOMS	---	---	9,771.4	11,627.9	100	11,627.9			---
ASPARAGUS	---	---	1,080.0	1,069.2	100	1,069.2			432,0
BROCCOLI	4,250.0	3,782.5	6,120.0	5,446.8	31	1,664.3			720.0
CAULIFLOWER	---	---	4,759.3	2,522.4	100	2,522.4			468.0
SPINACH	---	---	2,562.7	2,024.5	100	2,024.5			366.1
GARLIC	---	---	2,928.8	2,255.2	100	2,255.2			225.3

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VEGETABLES, FRESH (Continued)

DEHYDRATED ONIONS	---	---	9,772.0	46,414.2	100	46,414.2			59.0
EGGPLANT	1,000.0	490.0	1,803.5	883.7	45	393.7			73.2
DRIED FIELD PEAS	---	---	1,464.5	571.1	100	571.1			---
DRIED BEANS	---	---	23,799.0	15,707.3	100	15,707.3			---
MINOR VEG.	---	---	9,885.0	5,832.1	---	5,832.1			---
RHUBARB	75.0	---	---	---	---	---	---	---	---
PUMPKIN	12,000.0	---	---	---	---	---	---	---	---
OKRA	200.0	---	---	---	---	---	---	---	---
GREENS	---	---	---	---	---	---	---	---	---
TURNIPS	6,000.0	---	---	---	---	---	---	---	---
PEPPERS	2,000.0	---	---	---	---	---	---	---	---
VEGETABLES, PROCESSED									
(C)anned & (F)rozen									
ASPARAGUS									
F	---	---	291.0	750.8	100	750.8			116.4
C	---	---	1,098.0	1,690.9	100	1,690.9			439.2
SNAP BEANS									
F	---	---	3,661.0	3,331.5	100	3,331.5			665.7
C	---	---	22,700.0	7,945.0	100	7,945.0			4,127.2
LIMA BEANS									
F	---	---	1,720.0	1,582.4	100	1,582.4			573.3
C	---	---	1,098.0	713.7	100	713.7			366.0
CARROTS									
F	---	---	3,405.0	1,974.9	100	1,974.9			121.6
C	---	---	1,803.0	721.2	100	721.2			65.3
PEAS									
F	---	---	5,638.0	4,172.1	100	4,172.1			2,013.5
C	---	---	12,082.0	5,195.3	100	5,195.3			431.5
CORN									
F	---	---	7,066.0	5,440.8	100	5,440.8			706.6
C	---	---	21,236.0	8,282.0	100	8,282.0			2,123.6
SPINACH									
F	---	---	2,746.0	1,427.9	100	1,427.9			196.1
C	---	---	1,830.0	951.6	100	951.6			36.3
BROCCOLI (F)	---	---	5,126.0	4,818.4	100	4,818.4			603.0
BRUSSEL SPROUTS (F)	---	---	915.0	823.5	100	823.5			79.5
CAULIFLOWER (F)	---	---	1,684.0	1,599.8	100	1,599.8			168.4
ONIONS (F)	---	---	2,489.0	2,090.7	100	2,090.7			80.2
GREENS (C)	---	---	878.0	544.4	100	544.4			---
PUMPKIN (C)	---	---	1,464.4	483.3	100	483.3			---
BEETS (C)	---	---	4,393.0	1,669.3	100	1,669.3			168.9
PICKLES (C)	---	---	25,263.0	21,726.1	100	21,726.1			2,526.3
WHOLE TOMATOES (C)	---	---	22,334.0	8,710.2	100	8,710.2			1,514.5
TOMATOES-VEG. JUICES	---	---	11,715.2	3,613.1	100	3,613.1			---
SAUERKRAUT	---	---	4,393.0	2,064.7	100	2,064.7			109.8
BELL PEPPERS	22,300.0	16,279.0	12,081.3	8,819.3			46	7,459.7	1,569.0
SWEET POTATOES	---	---	3,661.0	2,818.9	100	2,818.9			318.3
POTATO CHIPS	12,500.0	27,500.0	61,878.0	136,131.6	80	108,631.6			2,475.1

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FRUITS									
APPLES	19,100.0	12,224.0	58,576.0	37,488.6	68	25,264.6			419.9
PEACHES	15,500.0	8,525.0	19,769.4	10,873.1	22	2,348.2			248.4
PEARS	---	---	8,786.4	5,008.2	100	5,008.2			126.4
CHERRIES	---	---	2,196.1	2,666.6	100	2,666.6			231.1
STRAWBERRIES	---	---	6,223.7	6,223.7	100	6,223.7			189.2
GRAPES	---	---	13,179.6	13,535.4	100	13,535.4			292.9
MELLONS	3,450.0	276.0	61,870.9	4,949.6	99	4,673.6			511.3
PLUMS/PRUNES	---	---	5,491.5	2,650.8	100	2,690.8			84.2
DRIED FRUIT	---	---	10,764.0	21,528.0	100	21,528.0			---
FROZEN FRUIT	---	---	10,142.0	12,170.4	100	12,170.4			---
FRUIT JUICES	---	---	46,390.0	51,956.7	100	51,956.7			---
CANNED PEACHES	---	---	68,269.0	25,942.2	100	25,942.2			---
FATS AND OILS									
LARD AND TALLOW	---	---	9,152.5	6,406.7	100	6,406.7			---
MARGARINE	---	---	41,003.2	18,861.5	100	18,861.5			---
SHORTENING	---	---	66,996.3	48,907.2	100	48,907.2			---
OILS	---	---	83,961.8	88,999.5	100	88,999.5			---
MISCELLANEOUS									
SUGAR	---	---	581,616.0	200,646.4	100	200,646.4			---
FLOUR	---	---	402,710.0	88,596.2	100	88,596.2			169,919.0
HONEY	1,404.0	1,404.0	4,758.8	4,758.8	71	3,354.8			---
CORN MEAL	---	---	27,457.5	5,766.0	100	5,766.0			8,335.6
TEA[i]	200.0	---	2,928.2	---	---	---	---	---	---
TOTALS		1,734,855.4		3,028,153.9		1,882,951.5		589,376.7	2,243,518.7

RETAIL VALUE OF KENTUCKY FOOD PRODUCTION	$1,734,855.4	
RETAIL VALUE OF KENTUCKY FOOD EXPORTS	-589,376.7	
VALUE OF PRODUCTION REMAINING	1,145,478.7	= 37% OF CONSUMPTION IN THE STATE

KENTUCKY IMPORTS 63% OF ITS FOOD

[a] As determined by food production, and consumption by weight and retail value; prepared by Michael J. Greene, Kentucky Research and Services, 2005 Newman Road, Lexington, Kentucky 40503. All rights reserved. [b] Per Kentucky Agricultural Statistics, 1980-1981; X retail price/lb. [c] (Ky 1980 population X national average per capita consumption) X (price/lb); price/lb derived from data published by U. S. Bureau of Labor Statistics, Amer. Chamb. of Commerce Researchers Assoc., Ky Farm Bureau Federation, and Pennsylvania Cornucopia Project Report. [d] (Retail weight of Ky production) ÷ (Retail weight of Ky consumption) = % Imports; (Retail value of Ky consumption) - (Retail value of Ky production) = Retail value Ky imports. [e] (Retail value of Ky production) - (Retail value of Ky consumption) = Retail value of Ky exports. [f] (Ky consumption) ÷ (national average yields/acre) = Ky cropland requirements; feed requirements for live stock supplied by UK College of Agriculture faculty/staff. [g] Production figures for cheese, butter, ice cream are for 1978, Ag. Stats, USDA. [h] 1982 data supplied by Dr. Dick Roberts, UK College of Agriculture. [i] Ginseng.

Kentucky Food System Organizations

There are many organizations which directly or indirectly are working toward developing a sustainable food system in Kentucky. The following is a selected list of organizations working with consumers, farmers, and the food industry in Kentucky

Agriculture Colleges and State Universities

* Dr. Robert L. Johnstone, Head
Agriculture Department
Berea College
Berea, KY 40403
(606) 986-9341 Ext. 525

* Dr. Dwight Barkley, Head
Agriculture Department
Eastern Kentucky University
Richmond, KY 40475
(606)622-2031

* Mr. Robert Wolf, Acting Head
Agriculture Department
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The Montana Food System:
FIRST LESSONS IN SUSTAINABILITY

A study of the food system of Montana by
WARREN PALMER

and

The Cornucopia Project of the
Regenerative Agriculture Association

33 East Minor Street
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1983

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FIRST LESSONS IN SUSTAINABILITY

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August 1983

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1.0 INTRODUCTION

This paper reports the results of a three month study of Montana's food system conducted with the support of the Cornucopia Project of Rodale Press.

The primary goal of this study was to identify the fundamental components of the Montana food system and to diagnose their sustainability. The Montana food system - like the larger U.S. food system of which it is an integral part - has serious problems which threaten its long-term sustainability.

Another goal of the study was to compile an inventory of the different foods produced, imported and consumed in the state.

The study's third objective was to identify actions that can be taken by producers and consumers, state and local governments, business and industry to promote the development of a more stable food system.

Finally, the study strove to demonstrate the need for a thorough understanding of the food system and for careful planning of its future. This study is certainly not the last word on Montana's food system. It may well be the first word. During my research, I discovered no complete study of Montana's food system. All the information necessary for such a study is not available. Therefore the present report can only be a rough sketch of the more complete portrait that yet needs to be drawn of our food system. If all this paper does is to demonstrate the need for such research, then it will have fulfilled its ultimate purpose.

That a better picture of our food system does not exist attests, in part, to the incredible productiveness of Montana's - and America's - agriculture in the last four decades. But studies such as those sponsored by the Cornucopia Project have begun to reveal that all is not well in the U.S. food system.(1) While the U.S. food system is not about to collapse by any means, supply disruption, dramatic price surges and crisis are definite possibilities.

Even a few statistics indicate the importance of the food system to Montana and hint at the disruptions that will result in the state in response to disruptions in the food system:

*Total food expenditures in Montana in 1979 were approximately $1 billion or $1,330 per capita.(2)

*Agriculture, the state's largest industry, had assets over $18 billion in 1981(3) and a gross income over $1.5 billion.(4)

*One-fourth of Montana workers are employed by the food system. At least 71,307 workers earned $455 million in 1980.(5)

The Cornucopia Project exists to encourage the development of a stable and sustainable food system. Presently the national food system is heavily dependent upon the input of non-renewable resources. It uses large quantities of fossil fuels, consumes ground water faster than it can be replenished, mines the topsoil with erosion-prone agricultural practices and squanders valuable organic matter through incomplete recycling. In the long-run these practices are not sustainable and no society dependent upon them can long ensure its own stability and progress.

This study found that Montana shares some, but not all, of the problems of the larger U.S. food system. In addition, our state's food system will encounter in the years ahead pressures that are uniquely its own.

2.0 WHAT IS A FOOD SYSTEM?

The food system is the entire process whereby a society obtains, maintains and ensures the nutrition of its members. "The food system is that segment of our economy that deals directly or indirectly with food products."(6) It is a flow, "an intricately woven pattern of many disciplines and occupations encompassing far more than farming",(7) a continuous interaction among the entire collection of industries, laws and attitudes that are concerned with the most essential of human activities: the procurement of food. Quite simply the food system is how we feed ourselves.

The food system may be best analyzed as a system of other systems that overlap and interact. The component systems are:

-The Production System: This includes agriculture and the agricultural support industries - seed suppliers, fertilizer manufacturers, equipment manufacturers, etc.

-The Transportation System: Agricultural products have to be transported from the farm to processors, from processors to distributors, from distributors to consumers.

-The Energy System: Our food system is highly energy intensive; it consumes a significant share of the national and state energy budget. Energy runs the production system, fuels the transportation system, operates the processing and distribution systems - and cooks our food.

-The Water System: Irrigation, the largest user of water in the food system, is also the largest source of water consumption in the nation. Water is also important in transporting, processing and preparing food. Finally it is used in the disposal of food and human wastes.

-The Processing System: This system collects, warehouses, mills, slaughters, prepares, packages the raw agricultural product into a form usuable by the distribution system. Most food in the U.S. undergoes some form of processing before it reaches the consumer.

-The Distribution System: This includes all the processes whereby food is delivered into the hands of the consumer: grocery stores, restaurants, cafeterias, even vending machines.

-The Home Food System: This system encompasses all the activities involved with the preparation of food at home. Obviously it includes the kitchen and everything in it. Indirectly it includes the kitchen appliance trade, the cookbook industry and that part of the home construction craft that builds the kitchen in the first place.

-The Waste Disposal System: Garbage, processing residues, human and animal wastes are natural by-products of the entire food system. The system that recycles these 'wastes' back to the land is a vital part of the whole system.

-The Government System: Many different governments (state, local, federal) are thoroughly involved in the food system. Government regulates, researches, legislates and taxes the food system.

These major systems compose the larger system. While each system is a definable entity, the definitions are also somewhat arbitrary and artificial. It is often hard to decide where one system stops and another begins. Also there are other ways to break down and analyze the food system that are equally correct. But the important point is not how the system is broken down but how it is put together, how it operates and what impedes or threatens its continued operation.

3.0 THE PRODUCTION SYSTEM

Agriculture is the basis of all food systems. A sustainable production system is a prerequisite for a sustainable food system. Neither Montana nor the nation have anything approaching a stable, sustainable production system.

In Montana, agriculture is the number one industry with gross receipts more than double that of the next most important industry, oil and gas. In 1980, the state's farms and ranches contributed $1.5 billion to Montana's economy.(8) It is not surprising that agriculture is so important in the state since 66 percent of the state's land is in ranches and farms - 62,100,000 acres - the second highest in the nation.(9)

Yet while Montana ranks second in number of acres in ranches and farms, it only ranks 32nd in agricultural income. That fact points out what Montana farmers know well: it takes a lot of land to make a living in agriculture in Montana. Eastern Montana, where most ranches and farms are located, is a dry land that Stephen Long, a government explorer, dubbed 'the Great American Desert' in 1820.(10) Later in the nineteenth century, ranchers discovered that this 'desert' could raise excellent beef, and in the early part of the twentieth century farmers found that the ploughed up 'desert' could grow bumper crops of wheat. Stephen Long was not entirely wrong though; eastern Montana is a semi-arid land that experiences extreme climate fluctuations. Ranchers learned this lesson during the winter of 1886-87 when the combination of a summer drought, overgrazing and an unexpectedly severe winter killed 60 percent of the cattle herds in the state.(11) Farmers also learned this lesson when extended drought during 1917-19 prompted the exodus of 40-60,000 homesteaders.(12) Those who remained had to learn to live with the land, to understand what it is and is not capable of.

In the years since the Great Depression, Montana agriculture has learned to farm the plains. It has not been easy; agriculture has always been a risky business. In recent years it has barely been profitable. Plus there are new risks and threats to Montana's agriculture that could make the years ahead even more difficult.

3.1 Threats To Agriculture

3.1.1 Development -

At first glance, the withdrawal of productive land from agriculture by urban, rural and commercial development does not seem to be a serious problem in Montana as it is in much of the nation. In the U.S. overall three million acres of cropland and potential cropland are lost through development each year.(13) In Montana, land in farms has remained a fairly constant 62,100,000 acres since 1977.(14) Even though the number of acres in production has not decreased, there are important changes occurring in agricultural lands that could adversely affect our food system.

Changes in agricultural lands can be hidden by the substitution of marginal lands for prime agricultural lands, by the way that farms are defined and by the nature of Montana's subdivision law.

The U.S.D.A. "defines a farm, for statistical purposes, as "any place from which $1000 or more of agricultural products were sold or normally would have been sold during the census year."(15) Under this definition, a family with a one-acre lot and a large garden could be considered a farm family. Also a large ranch could be broken up into 'ranchettes' of twenty acres each, and if each owner had a garden and a little livestock, then there would not be any change, statistically, in acres of agricultural land. Realistically though, the output of the former ranch would be altered.

Such a subdivision process has been taking place in Montana. The number of farms in Montana has increased by 100 each year for the past five years.(16) In Missoula, Ravalli, Flathead, Gallatin and other counties, large ranches have been subdivided into semi-residential ranchettes.

Montana's subdivision law partially obscures such development. The law only applies to subdivisions where land is being divided into parcels smaller than 20 acres. Therefore agricultural land can be sold off in lots of 20 acres or more without review, and then the new owners can further divide the land through occasional sales which are exempt from the subdivision law. The net effect is that significant changes can occur in Montana agricultural lands without showing up in yearly agricultural statistics.

One example of such hidden development can be found in Gallatin County. According to Gordon Watson, state coordinator of the National Resources Inventory, statistics show that 28,660 acres of the county are occupied by residential and commercial uses, but semi-residential development has removed perhaps another 170,000 acres from traditional production.(17)

While the conversion of ranches to ranchettes permanently removes these lands from large-scale agricultural production, not all aspects of this development have a necessarily negative impact on food production. If the ranchette owners use their mini-farms for the intensive production of fruits and vegetables or even of hay and livestock, then the net long-term effect of such conversion will be neutral or even positive. The part-time farmers will probably engage in a more labor-intensive, energy-conserving production process than the large-scale producers. But if the ranchette owners leave the land permanently fallow or abuse the land with erosion-producing practices, then the effect will be negative.

Not all development is in the form of ranchettes. "In Montana 350,000 acres of agricultural land were converted to urban, built-up, transportation and water uses from 1967 to 1977."(18) Farmers on the fringes of expanding cities and towns face unique pressures. 'Leap-frog' development may isolate patches of agricultural land within increasingly urban surroundings. The inflated land prices that accompany such development pressures farmers to sell out. Also the normal agricultural practices of the farmer or rancher come into conflict with the desires of the more numerous new residents further increasing the pressures on the farmer.

Often times the land developed around cities and towns is the better agricultural land in the state. While the total number of acres in agriculture may be maintained by bringing marginal lands into production, a net loss has still occurred. Not only has the increased productivity of the developed prime agricultural land been lost, the farming of marginal lands leads to increased erosion with increased pollution of air and water in the state.

In summary, development is affecting Montana's agriculture in ways that are not completely recorded. It does not seem to be a problem out of control, but in order to guarantee the sustainability of Montana's production system, development needs to be more closely monitored.

3.1.2 Erosion -

In the United States, erosion is one of the gravest threats to the long-term productiveness of the food system. The 'tolerable rate' of soil erosion, the maximum at which the soil's fertility can be sustained, is about five tons per acre per year. In the U.S. the average soil loss per acre due to wind, sheet and rill erosion is around 5.1 tons per year, and in Montana the rate is about 4.9 tons per acre per year - apparently not a critical problem.(19) These average figures obscure the serious damage that is occurring; also, erosion losses due to irrigation or snow melt are not calculated. Also, in Montana the tolerable rate of soil loss is not the same on all land; it varies in the range of two to five tons per year. (20)

Actual erosion rates depend on types of soil, locality, local weather, crop grown and farming practices. Some uses, such as hay production, result in little erosion while other uses, such as summer fallow production of wheat, produce much higher soil losses.

Soil that requires centuries to accumulate can blow away in a short time on the edge of a hot, dry wind or wash away in a sudden downpour. Sustainable agriculture cannot be built upon eroding topsoil, and much of Montana's farm-land is eroding at a degrading rate.

In 1977 Montana had 2.7 million acres of cropland with wind erosion rates of 5 - 14 tons/acre/year plus 774 thousand acres losing soil to the wind faster than 14 tons/acre/year. Sheet and rill erosion damaged 500 thousand acres of cropland and 2.4 million acres of pasture or grazing land at a rate of 5 - 14 tons/acre/year. This water erosion also caused 61 thousand acres of cropland and 1.2 million acres of grazing land to shed their topsoil at rates above 14 tons/acre/year.(21)

About 70 percent of the land in farms and ranches in Montana is rangeland and pasture.(22) Approximately 43 percent of the rangeland is judged to be in poor to very poor condition which means that more than 60 percent of the "present vegetation and ground cover depart from that which is presumed to be the natural potential of the site."(23) The Resource Conservation Plan of the Montana Conservation Districts asserts that "Montana's rangeland has historically been abused through overgrazing and mismanagement" and that the state's rangelands are producing at only 59 percent of their potential.(24) Range improvement would not only increase production, it would also decrease erosion and pollution of the water and the air.

Wind is the most serious erosive force in Montana. The state has the second worst wind erosion problem in the nation.(25) It is a preventable problem that is aggravated by cropping and cultivating practices and by cyclical dry spells. Summer fallowing, which leaves the wheat fields unprotected by plant cover, greatly contributes to the wind erosion problems. The areas of the state that suffer most from wind erosion, such as the north-central triangle area and the Highline, are also prime wheat growing areas where summer fallowing is a common practice. Only North Dakota has more acres in summer fallow than Montana, and accordingly North Dakota has the worst wind erosion problems in the nation.(26)

Wind erosion does not just strip the land of its soil; it removes the most fertile part of the soil: the finer particles that contain most of the soil's nutrients. The fine air-borne particles may have up to 9 times the nitrogen, 19 times the phosphorous and 10 times the organic matter as the soil left behind. A Canadian soil scientist discovered after a 1981 dust storm in Canada that samples of the fine dirt swept into the ditches by the wind were five times richer in nitrogen than the samples from the eroded fields.(27)

So the costs of soil erosion are many. The loss of topsoil will eventually be reflected in decreased yields. Counteracting the yield decrease will require increased applications of expensive fertilizers. A cost that the individual farmer does not have to pay but is borne by the whole society is the degradation of air and water quality that results from erosion. One of the most obvious short term costs is nutrient and water loss.

What would it cost to actually replace the soil lost to erosion? That is very hard, if not impossible, to calculate. Nature requires anywhere from 100 to 1500 years to generate an inch of topsoil. If all the soil in excess of the tolerable rate lost each year in Montana was replaced with 'manufactured' soil - compost - the bill would be $2 - 4 billion a year.(28)

3.1.3 Saline Seep -

In addition to wind erosion, summer fallowing can result in saline seep. The purpose of summer fallowing is to control weeds and to accumulate soil moisture for the next summer's wheat crop. Particularly during a wet year, excess moisture can accumulate in the soil. When this excess water sinks down through the soil and subsoil, it dissolves the naturally occurring salts. Often the salt laden water flows downhill and emerges in the form of a low volume spring. Then as the water evaporates, a salty crust is left behind causing the production of crops or grass on that land to be decreased or eliminated.

In 1978 an estimated 200,000 acres were out of production due to saline seep. And that figure may be too conservative.(29) Furthermore, saline seep land is expanding on the average by ten percent a year. "Expansion of seep areas by 20 to 200 percent in wet years is not uncommon, whereas expansion of only a few percent may occur in dry years."(30) New figures on the exact extent of saline seep are not yet available, but a conservative estimate would be that more than 250,000 acres are now lost to production.(31) It is possible to restore saline seeps to production over a period of 10 - 15 years if correct conservation practices are carefully followed.(32)

Besides damaging agricultural land, saline seep may also be contributing to the salinity of surface and ground water through the salt contamination of reservoirs, streams and also of shallow acquifers.

3.1.4 Coal And Agriculture -

Whether or not coal development harms agriculture is a question that is still open to debate. Yet it is true that coal development does not in any way aid agriculture; therefore, any impact on agriculture from coal will be negative. Supporters of coal development contend that over the long-run these impacts will be negligible. Critics insist that the opposite is true. Who is right? Only time will tell. If time does show that coal development hurts agriculture in Montana, then it will have been an expensive experiment for an agricultural state.

Coal development affects agriculture in many ways: Land is directly removed from production for the mines and their support facilities, for coal-fired generating plants and their support facilities and for high-voltage transmission lines. High-voltage power lines create an obstacle and a hazard to farmers whose fields they cross. Coal development competes with farmers for water in some areas, and coal mining disrupts acquifers in the area of the coal mine while posing a potential threat of ground water pollution. Finally the emissions of coal-fired power plants produce acid rain and other pollutants that can decrease crop yields, and the plants increase atmospheric carbon dioxide.

Acid rain has been shown to inhibit the growth of a variety of grasses. During times of additional stress, such as would result from drought and severe winter, small grains and grasses in eastern Montana that are subjected to this pollution may be less able to withstand stress. Thus pollution may not destroy the land directly, but it can weaken its ability to survive the climatic variation that is a fact of life on the Montana plains.(33)

High-voltage power lines produce a powerful electro-magnetic field whose effects on living matter are not yet fully researched. Some studies indicate that this field disrupts living processes.(34) What is known is that farmers working in the vicinity of high-power lines can be severely shocked or electrocuted. Irrigation systems operated around transmission lines are particularly hazardous. "Even without these kinds of problems, farmers face disruptions and added costs in their operations where power line structures are placed in their fields."(35)

It seems reasonable to question the compatibility of a sustainable agriculture and coal development. Coal development will not go away, but it should be recognized as a stop-gap measure. Without an agressive movement toward a sustainable society, coal development only postpones the necessary transition to renewable fuels: a transition that will only be more difficult with the passing years. As Montana historian K. Ross Toole said, "Whatever the final revenue Montana may gain from the mining of coal, the process is ephemeral. Agriculture is self-renewing."(36)

3.2 ECONOMICS AND THE STRUCTURE OF AGRICULTURE IN MONTANA

Even if agricultural land was not being threatened by land development, erosion, saline seep and energy production, the abiding problem of agriculture would still remain: it is a risky way to make a living.

The average farmer works long hours that would send his/her urban counterpart to the picket line. Farming is hazardous, the third most dangerous occupation in the country. Nation-wide there are 200,000 disablng injuries and 2,000 deaths per year from farm accidents. Also, the farmer has a higher risk of dying from leukemia, skin tumors and physical agents (herbicides, pesticides and other chemicals) than the rest of the population.(37)

In addition to the health risks, the farmer faces harsh economic risks. The income of the individual farmer is dependent on an array of conditions outside of his control. Farm income is extremely volatile, surging or declining from one year to the next. Since 1975 cash receipts from marketings have only exceeded production expenses twice for the state's agriculture. Were it not for government payments, Montana agriculture overall would not have been able to pay its bills in the other years.(38)

Low farm income has been a recognized national problem for decades and an assumed responsibility of the Federal government since the 1930's. Yet with all the government programs designed to boost farm income and 'save' the family farm, poverty is prevalent, income is erratic and family farms continue to disappear. Why? What is the farm problem?

The farm problem is not really one problem but a whole series of interconnected problems. In part, the farm problem is a chronic overproduction of agricultural products. At the same time, the last decade has shown that problems of surplus can be rapidly replaced by problems of shortage. Through it all, the individual farmer is caught in the middle trying to effectively respond to inflation, to the erratic acts of governments and to the pressures of large agribusiness firms.

Francis Moore Lappe, identifying one aspect of the farm problem, testified before the Committee on Agriculture of the U.S. House of Representatives that the farm problem "is the dynamic underlying the farm economy in which farmers are squeezed between rising costs and falling prices for their production. The root cause of the farm squeeze is that farmers are largely price takers, but they must confront price makers both when they buy what they need to make land produce and when they sell their crops."(39)

To understand why this is so requires an understanding of basic agricultural economics.

The demand for agricultural products in the U.S. is relatively price and income inelastic; that is, when product price or consumer income fluctuate, the quantity demanded of basic agricultural commodities remains relatively stable. If prices double, people do not eat half as much, and if incomes double, people do not double their caloric intake (assuming that they were already receiving adequate nutrition). A person with increasing income may spend more money on food by dining out or purchasing more expensive, more processed foods, but her consumption of pounds of wheat, vegetables or meat changes only within certain narrow limits in the short run. Also, if the supply of a basic commodity such as wheat increases, price will have to decrease dramatically to induce increased consumption - particularly when foods are processed. Agriculture's share of the retail price of processed food decreases as processing increases. For example, farmers only receive five and a half cents out of every 52 cents spent on white bread; the remainder goes to milling, baking and retailing.(40) A decrease in the price of wheat by 50 percent would have little effect - scarcely 3 cents - upon the price, and therefore the consumption of bread.

Individual farmers can do nothing to effect the prices they receive; they are price takers. In their view the way to increase income is to increase output. Since all farmers will have the same view, they will all increase production, and the increased production will depress the prices that they receive. The final result may be that there is no net gain at all to the farmers from their increased production.

This discussion may seem far removed from the problems of agriculture and of the food system, but these basic economics have a direct bearing on how much food is grown, how it is grown and whether it will continue to be grown and sold in stable quantities, qualities and prices. Still these economic principles are not the only ones that determine the income of agriculture.

The forces affecting the market that confronts the Montana farmer are national and international, are ruled by the interests of nations and of the large agribusiness firms that sell supplies to the farmers and buy, process and distribute their product. It is with these large corporations that the farmer must compete for his or her share of the retail food dollar.

Both the input and output markets of agriculture have a number of giant firms that are price leaders, 'price makers' that possess power and influence with which the individual farmer can not begin to compete. Some of the results of this situation are:

*Between 1959 and 1977 the prices paid by farmers for supplies increased every year except one while farm prices dropped five times.(41)

*In 1972 four U.S. tractor manufacturers, producers of 75 percent of tractors sold in America at the time, overcharged U.S. farmers $251 million according to U.S. Trade Commission statistics.(42)

*In the same year the animal feed industry, dominated by Purina and Cargill, overcharged farmers by about $200 million.(43)

*Five large grain companies control 85 percent of U.S. grain exports.

*The largest grain company, Cargill Corporation, had a 441 percent profit increase (in constant dollars) since the late 1960's while the real income of farmers has not improved.(44)

*During the past ten years, 60 small seed companies were bought up by 20 large corporations so that the seed trade is becoming dominated by a few large firms. This trend plus the introduction of restrictive varietal legislation leads, some critics say, to decreased genetic diversity and increased vulnerability.(45)

Cargill, a private corporation controlled by just two families, epitomizes the development of multinational agribusiness conglomerates that now dominate the food system. Cargill is the largest private corporation in the U.S. with sales in 1979 of $12.6 billion(46), and it is involved in all facets of the food system. It sells seed, feed, fertilizer and farm equipment. It has a Poultry Products Division, a poultry breeding operation, beef feedlots and owns the second largest meat packing firm in the world, MPBXL Corporation. In the grain trade Cargill, the world's largest grain trader, has an integrated system of country, terminal and port elevators; a sophisticated transportation network that includes 1500 rail cars and a number of barge companies; plus several grain processing plants. Cargill's Seaboard Allied Milling Corporation is the largest flour miller in the world. To finance its world-wide operations Cargill can draw on the resources of the three insurance companies and one bank that it owns. When that is insufficient to cover its credit demands, Cargill can access an unsecured line of credit from the nation's major commercial banks. Finally in order to wheel and deal in the international marketplace - and to protect a portion of its profits on the sale of U.S. grain from U.S. taxation - Cargill operates international corporations headquartered in Panama and Switzerland.(47)

Clearly agribusiness firms such as Cargill have the resources and the abilities to manipulate markets for their own profits to the detriment of smaller producers. Even if such manipulation had not been documented in books such as MERCHANTS OF GRAIN by Dan Morgan or A POOR HARVEST by Richard Gilmore, it would be naive to assume that such market machinations do not exist. Particularly in the grain trade, such firms are ideally situated through their global information networks to perceive hidden trends in the movement of agricultural supply and demand, and to rapidly benefit from their inside information.

The benefit comes though at the expense of the individual farmers who do not have an intelligence network of similar scope to inform them of impending foreign grain sales or of crop conditions and demand around the world.(48)

What does all this have to do with Montana's food production system? About 80 percent of agricultural income in the state is derived from two products: cattle/calves and wheat. In 1980, 60 percent of the Montana wheat crop was exported out of the country.(49) There is an aggressive program in the state to promote the foreign consumption of Montana wheat and other agricultural products. Yet this policy by itself will not insulate the Montana wheat farmer from the vagaries of the market or the activities of agribusiness.

An aggressive wheat export program may in the short run benefit the wheat farmer, but the long run result of such a policy is indeterminate. The expansion of foreign markets does not result in just marketing current production at a higher price, it also encourages expanded production. The higher price draws marginal lands into production. The net result may be that total production increases, the need to sustain and continue to expand exports increases - and soil erosion increases. There is a definite trade off between controlling erosion and an aggressive production/export strategy. Also such an export-focused policy increases the vulnerability of Montana's agriculture to price fluctuations resulting from changes in foreign demand, from operations of large grain traders and from policy changes of foreign governments.

Increasing dependence on agricultural export may increase income in some years, but it will also increase the fluctuations in income. A TIME TO CHOOSE, a study by the USDA, predicted that "... vacillation between short periods of comfortable supplies and discomfitting shortages will occur with increased frequency... Recent projections suggest that the price volatility which could result from such vacillation between shortages and surpluses may be even greater than in the 1970's."(50)

There are many important questions about the economics and structure of agriculture in Montana that this report has neither posed nor attempted to answer. For example, what changes are occurring in farm tenure in the state? How does farm tenure, whether the farm is owned or rented by its operator, affect the operation of farms? There is some evidence that suggests that farms operated by non-owners have increased erosion problems.(51) If non-owner operation is increasing, will erosion also increase?

Questions like these need to continue to be studied in the context of food system analysis in order to understand the future of Montana's food system.

4.0 THE WATER SYSTEM

While most people do not think of water as food, it is a vital nutrient. On the average we each need to drink at least two and a third quarts a day. Beyond this bare necessity though our food sytem requires large quantities of water.

The manner in which the food system utilizes water is crucial to the continued supply of clean water and to the overall health of the state and the nation's rivers and lakes. Careless irrigation and insufficient treatment of municipal wastewater can quickly degrade the quality of rivers. Carried to an extreme, such careless practices can render the remaining water in a river unfit for any use.

Irrigation uses 95 percent of water consumed in the state. Municipal, industrial and other rural uses consume the rest. In 1981, 18 percent of acres harvested in the state were irrigated.(52) Between 1974-78 an average of 19 percent of harvested acres were irrigated, and these irrigated acres yielded 28 percent of the value of crop production.(53) Sixty percent of all hay harvested came from irrigated land.(54) While most of the land that can be irrigated by simple gravity diversion has already been developed, one study calculated that Montana has 11.5 million more acres suitable for irrigation with 3 million of those acres of high potential.(55)

The main source of irrigation water is diverted flow from rivers, creeks or impoundments; only one percent is pumped from wells.(56) Many dams impounding water for irrigation are in need of repair. For example, the state directly owns 25 dams that provide irrigation to 100,000 acres. Twenty-one of these are listed as high-hazard dams, and the cost of making needed repairs would be $150 - 200 million.(57)

Only about one-fourth of water diverted for irrigation is actually used by the crop. The rest is either lost through leakage, evaporation or returned to the stream. Irrigation run-off returned to the stream produces pollution problems in three ways. First, evaporation has concentrated salts already present in the water, so that the returned water will have increased salinity. Second, return flow contains additional salts dissolved from the irrigated fields. Each acre of irrigated land can add one-half to two tons of salts to streams each year.(58) Finally, streams can be so dewatered by irrigation and other uses that the remaining water is unfit for any use. Such is already the case in some lower parts of the Yellowstone drainage where salinity levels are too high for municipal supply and drinking water.(59)

5.0 THE ENERGY SYSTEM

"If the nation were trying to plan a strategy that would make American farmers most dangerously vulnerable to price inflation based on a petroleum shortage, it would be hard to plan one more effective than the recent trends in the use of chemicals and power machinery.."(60) - Ralph Sampson

"To feed the entire world with a U.S. type food system, almost 80 percent of the world's annual energy expediture would be required just for the food system."(61)

The essence of food production is the transformation of solar energy into plant matter. Upon this conversion our lives depend. In subsistence agriculture, human and animal energy, directly fueled by plants, powers the food system. In our more sophisticated system, fossil fuels replace human and animal power. Yet we all know that these energy sources are finite and non-renewable. A stable, sustainable food system should begin substituting renewable energy sources for fossil fuels.

Unfortunately, Montana's (and the nation's) food system has been doing exactly the opposite for the last forty years. Every system that makes up the food system is dependent upon the input of large quantities of fossil fuels. The fact that most consumers spend a smaller part of their income for food then they would have forty years ago is due in large part to the food system switching from labor intensive producton to energy intensive production. Our food system has been constructed upon a foundation of nonrenewable fossil fuels.

The United States food system requires about 17 percent of all commercial energy used annually. Farm production consumes about 15 percent of the food system non-solar energy budget; food processing uses about 30 percent, marketing and distribution about 11 percent, commercial eating establishments 17 percent and home food preparation and use 27 percent. (62)

Agriculture has benefited most perhaps from the substitution of fossil fuel energies for human labor power energies. the increases in labor productivity in the last four decades are due mostly to the mechanization of farming. This mechanization has not come at a high price in fuel use, relative to overall energy consumption. Agriculture only consumes about 3 percent of the nation's energy.(63) In Montana, agriculture consumes about 4.5 percent of energy in the state.(64) But this small percentage is very important;

agriculture cannot easily do without it. So dependent is agriculture on this energy input that one study reports that a doubling of energy prices would result in only a 5 percent reduction in total energy used in agriculture in the short run, and a 20 percent reduction in the nation's energy supply would produce a 55 percent rise in raw commodity prices.(65) This inelastic demand is attributed to the seasonal nature of farm operations, to the difficulty of quickly substituting human labor for machines and to the massive use of pesticides and herbicides.

The largest share of agricultural energy in Montana, about 44 percent, was consumed by pesticides and fertilizers. Field operations and farm vehicles use almost the same percentage of the energy budget, 23.3 and 22.8 percent respectively. The remainder, 9.5 percent, is utilized by all other farm operations: irrigation, crop drying, milking and milk cooling, etc.(66)

Not only is agriculture's demand for energy very inflexible, it is also very vulnerable to disruptions in foreign supply of crude oil. Overall 74 percent of the energy used in the U.S. is derived from petroleum-based energy. In contrast, 93 percent of energy devoted to agriculture originates from petroleum.(67)

It should be no surprise to anyone that energy costs in Montana's agriculture nearly tripled from 1975 to 1980. But then all agricultural production expenses were rising during the same period; the share of production expenses spent on petroleum products and fertilizer increased from 10.5 percent in 1975 to 13 percent in 1980.(68)

Beef prices may be most susceptible to variation due to energy costs since beef production accounts for approximately 25 percent of agriculture's energy usage.(69) The majority of this energy, perhaps 75 percent, is devoted to feed production.(70) Since most of the cattle in Montana are shipped to other states for finishing, beef production in the state is not as energy intensive as elsewhere. In general, feedlot beef requires 10 or more calories of non-solar energy subsidy for every calorie of food output whereas range-fed beef requires less than one calorie of non-solar energy input per calorie of output.(71)

The ratio between calories of energy input to agriculture and the number of calories output has steadily increased over the last forty years. "While we have about doubled farm output in the last 30 years, we have more than quadrupled our fuel consumption - so that farm output per gallon of fuel has declined by half."(72) In and of itself this energy subsidy is not necessarily a bad thing. The conversion of inedible petroleum calories into edible food calories through agricultural production is a highly valuable conversion and may be one of the best uses of fossil fuels. The problem is not that more calories of energy are put into production than are gotten out. The problems, as pointed out previously, are that these energy sources are non- renewable, will eventually be exhausted and the dependence on these energy sources makes agriculture very vulnerable to energy disruptions.

In recent years there has been a lot of hope invested in gasohol production. Some see gasohol production from grain as one way to free agriculture from its OPEC energy dependence. The impracticality of this proposal has been pointed out a number of times. To replace the gasoline and diesel used in American agriculture with gasohol would require the production from 133 million acres of corn.(73) According to agriculture expert Don Paarlberg, many studies indicate that more energy is used in producing alcohol than it yields.(74) A 1978 study, FEASIBILITY OF ETHANOL FROM GRAIN IN MONTANA, concluded that even with the most optimistic view, a Montana grain fermentation plant would not be a good investment without massive subsidies.(75) And finally, a massive investment in gasohol production would lock agriculture into intensive cropping practices that would further increase erosion, increase energy intensive production and escalate food prices.

A better strategy would be for agriculture to begin adopting and experimenting with renewable energy forms - not because energy use by agriculture is somehow 'bad', but because the energy usage patterns of agriculture threaten its stability.

During the research for this report, no study of the energy usage patterns of Montana's food system was found. This short description has by no means been complete. A thorough understanding of the state's food system requires such a study.

6.0 THE TRANSPORTATION SYSTEM

Transportation is particularly important to Montana's food system for three main reasons:

First, Montana's agriculture is export oriented. A reliable transportation system means that Montana produce can reach distant markets. Transportation costs amount to as much as one-third of some grain growers' costs.(76)

Second, the majority of food consumed in the state is shipped in from other states.

Third, Montana's large surface area and low population means that the state's extensive transportation network must be supported by fewer people than in other states. Montana has the highest ratio of highway miles to population of any state in the union.(77) This places a financial burden on Montana's population, and creates a financial challenge for its transportation system.

Without an adequate transportation system, Montana's entire food system will suffer. At the present time, the state's transportation system faces increased strain and deterioration.

6.1 The Highway System

The Governor's Transportation Advisory Council recently reported that "In Montana, transportation problems are approaching crisis proportions." They also warned that "...the state's major capital asset, its highways, faces ruin."(78)

Montana has 5400 miles of primary highways of which 474 require immediate reconstruction. Within the next five to ten years, this figure will increase to over 2,194 miles.(79) In other words, almost 50 percent of Montana's major highways will have to be rebuilt during this decade. Just to reconstruct the 474 miles that need rebuilding now will cost $286 million. Renewing the total 2,194 miles of highway will cost a staggering $1.3 billion.(80) As large as these figures are, they do not include necessary repairs of secondary roads.

Patterns of highway usage are connected to the railroad system. Any shipper in the state has to choose between the two systems. Sixty percent of Montana communities have no choice; they have no rail service.(81)

6.2 The Railroad System

Prior to its abandonment, the Milwaukee Railroad hauled approximately 15 percent of Montana grain shipped by rail. The Milwaukee shutdown affected 25 - 30 million bushels of grain. Since its closure some farmers have had to change crops due to increased shipping costs, and others have had to truck their grain longer distances often over secondary roads not built to withstand the heavier traffic.(82)

Burlington Northern has a virtual monopoly on rail transportation of grain in the state now. They haul 90 percent of the state's grain. Two actions on their part also contribute to increased hauling of grain by truck. First, they are abandoning about 10 percent of their track which carries about 3 percent of their volume. Second, they have instituted 52-car unit trains. Not all elevators will install facilities for loading unit trains, and among those that do, it is expected that some will go out of business. Fewer loading points will mean longer hauling distances for some farmers. For other farmers the lower shipping costs of the unit trains are a benefit.

The changes in the railroad system mean more pressure on highways. Increased truck traffic results in increased damage to the roads, particularly if trucks are overloaded. An axle carrying 24,000 pounds does three times the damage of an 18,000 pound axle. It is difficult to enforce weight restrictions in Montana, and the incentives to overload are great. A random survey of truck loads at various Great Falls elevators revealed a pattern of overloading with 69 percent of overloaded trucks carrying an average of 20,700 pounds per axle.(83)

Governor Ted Schwinden has said, "The fact is, you can't talk about agriculture in Montana without talking about transportation."(84) The same can be said about the entire food system. Its stability is directly related to the reliability and costs of transportation.

7.0 THE PROCESSING SYSTEM

Most agricultural products, about 75 percent (85), are processed in some manner before being purchased by the consumer. In Montana, most of the food consumed is not processed in the state. The manufacturing of food and kindred products employed about 3300 workers in Montana in 1980 (86). The majority of these workers were concentrated in meat packing, dairy product production, grain mill products, bakery products and beverage production. The 1980-81 Directory of Montana Manufacturers lists 95 firms manufacturing food and kindred products in the state. Included in this counting, though, are four ice manufacturers, 13 soft drink bottlers and 21 animal feed firms. While there are many small food processors in the state, it is difficult to obtain information about them and about the scope of the processing industry in general in the state. Even so, it is safe to conclude that, except for the above mentioned products, almost all canned goods, frozen foods, breakfast cereals, most beverages and other processed foods are produced outside the state and shipped in. Therefore, to understand the food processing part of Montana's food system it is necessary to examine the larger food processing system.

The food processing industry is characterized by both slow, steady growth and by rapid fluctuations. The volume of food sold increases about one percent a year in step with population increases. At the same time, some sections of the industry experience rapid growth while others decline. Therefore, while total sales nationwide increase slowly, an individual firm that can capture the public's fancy with a new product will have faster sales increases. An emphasis on packaging and promotion results.

The food processing system is the largest energy consumer in the overall food system. It is sixth in energy consumption of all U.S. industries consuming seven percent of industrial energy.(87) Only about one-third of this energy is a direct input. The majority ends up in packaging, buildings and machinery or in transportation.(88)

The food processing and marketing industry has both competitive and non-competitive elements. As mentioned, growth within segments of the industry can be very rapid. But other segments are characterized by the dominance of a few firms. For example, two firms, Kellogs and General Mills, control 62 percent of breakfast cereal sales.(89) Even the apparent diversity of products hides the real extent of corporate dominance. For example, Beatrice Foods markets 5000 products under 100 labels.(90)

Such concentration and market power can produce large sales and profits. At least 45 food companies had 1981 sales in excess of $1 billion. Market power can translate into higher consumer prices. "The Federal Trade Commission estimated that the concentrated food industry extracted $2.6 billion in overcharges on seventeen food lines alone" in 1972.(91) The food industry continues to be concentrated in fewer and fewer firms. The General Accounting Office claims, "Merger activity is causing 3 percent of all food manufacturing firms to disappear each year. Since 1975, merger activity has increased thirtyfold among food chains."(92)

Research did not produce any study detailing the relationship between the food processing industry and Montana's food system. Further study is necessary in order to determine how changes in the structure of the food industry can affect the state's food supply and to determine to what extent in-state processing can be promoted.

8.0 THE DISTRIBUTION SYSTEM

The distribution system delivers food into the hands of the consumer. It includes supermarkets, convenience stores, corner grocers, specialized food stores, farmers' markets, roadside stands, local restaurants, franchised restaurants, school cafeterias, even vending machines.

In many ways the distribution system and the processing system blend together. Supermarkets and restaurants process many of the foods they sell. In house bakeries are common in supermarkets. Some structures of the food system which form a bridge between the processing and distribution system are difficult to place solely within either system. For example, food wholesalers and warehousers may be owned and operated by firms that are primarily processors or by firms that are primarily distributors.

The distribution system is the direct link between the consumer and the food system. In 1980, Montanans spent about $1 billion on food.(93) The distribution system employed over 28,000 people in 1980 who received $175 million in wages.(94) This system not only is the direct link between consumers and the food system, but it also plays an important role in food storage. The ability of a food system to withstand supply disruptions caused by bad weather, strikes or other pressures depends to a great degree upon the supplies and reserves of the distribution system.

Apparently, there have been no thorough studies of supermarket and retail food trade in Montana. Therefore, detailed information about the grocery industry in Montana is not readily available. Yet, a general understanding of the industry in the state can be obtained from examining the national trends in the grocery industry since major national supermarket chains are an important part of the grocery industry in Montana.

Nationwide, supermarkets receive 70 cents out of every dollar spent on groceries.(95) Probably this ratio holds true for Montana since the average number of supermarkets in Montana per 100,000 people - 13.5 - is close to the national average of 12.6 stores per 100,000 people.(96) The trend in recent years has been toward fewer but larger supermarkets. Accompanying this trend has been the increase in convenience stores. Excluding gas sales, convenience stores now account for almost 6 percent of grocery sales.(97) The growth of convenience stores is reflected in the fact that Southland Corporation, operator of Seven-Eleven, had 1981 sales that were larger than those of the seventh largest supermarket chain.(98)

The average consumer spends as much as 37 percent of her food budget on food eaten away from home. The amount of money spent on eating out has been a rather constant 4.75 percent of disposable personal income for the last two decades.(99) What has changed during this time period is where that money has been spent. In the last 25 years, nationally owned or franchised restaurants have been steadily replacing locally owned restaurants.(100) This is a trend that does not appear to have peaked either. The number of food franchises increased by 50 percent between 1975 and 1981.(101) The president of McDonald's forsaw no end to the expansion in a 1979 interview: "I really believe that the years in which we can continue to pump in 350-400 stores domestically go on ad infinitum.."(102)

While consumers around the state and the nation have responded to the development and promotion of national restaurant chains in general and fast food chains in particular with an apparently insatiable appetite, this development is not without its problems, particularly in a state such as Montana. First, fast food is a highly packaged food. This packaging increases cost, is highly energy intensive and while it may boost individual sales, it does not improve nutrition. Second, the displacement of locally owned restaurants by franchises weakens the local economy. Particularly in a small business-oriented state like Montana, the growth of the franchise trade leaves less wealth within the community. The franchised restaurants are more likely to buy supplies from out of state suppliers and their profits are likely to flow out of the state. Third, franchised restaurants are less likely to respond to local variations in demand. Fourth, many fast food restaurants use imported beef in their hamburgers. About one-fourth of all beef consumed in the United States is consumed in fast food restaurants. Much of this is imported from South and Central America where the tropical forests are being destroyed to feed the fast food trade.(103) The impact on U.S. beef production is not negligible.

9.0 THE HOME FOOD SYSTEM

The home food system is a crucial part of the entire food system, and it is a major determinant of social patterns of food selection, preparation and storage, of nourishment, of energy usage and of waste disposal. The home food system contains within it elements of many other components of the food system. It produces, processes, transports and distributes food. Finally the home food system represents a substantial investment that might be initially overlooked.

How large is the home food system?

*If kitchen construction accounts for 10 percent of the cost of constructing a new home, then new kitchens cost $20 million in 1980 in Montana - $873 million in the U.S.(104)

*Nationally, the per capita value of major kitchen appliances shipped in 1980 was about $35. If Montanans purchased their share of these appliances, then they spent $27 million on them.(105)

*Similarly, the expenditures in Montana in 1980 on small electric kitchen appliances was perhaps $6 million.(106)

*The home food system is responsible for about one-fourth of residential energy consumption.(107) Thus the home food system in Montana consumed over $37 million of energy in 1979.(108)

*On the production side, Montana's 82,360 gardens produced 48 million pounds of food saving gardeners $36 million in 1980. Montana's gardeners spent around $4 million on garden supplies and equipment to cultivate 1,253 acres.(109)

*Food purchased for home preparation in 1980 in the state cost $740 million.(110)

*A conservative estimate of state expenditures on the home food system (excluding purchases of non-electric equipment, expenditures on transportation for shopping and on kitchen remodeling) would be at least $834 million.(111)

10.0 THE 'WASTE' SYSTEM

The organic product of agricultural lands must be returned to the soil in order to sustain fertility. While a large part of organic residues are returned to the land, there is still much room for improvement.

The annual production of organic residues is estimated by the USDA to be 800 million dry tons nationwide. The majority of this is a by-product of the food system. The largest component is crop residue - 54 percent of the total. Farm animal manure contributes 22 percent of the total. About one percent, 7.5 million pounds (dry weight), is sewage sludge and food processing waste.(112)

Although a large part of manure and crop residues are returned to the soil, a USDA study notes that improper management of these residues results in nutrient loss. "Under current...practices nearly 63 percent of the nitrogen in manure is lost through improper storage...[and] the maximum benefits of the crop residues returned to the soil...are generally not acheived because current management does not use crop residues effectively."(113) Improved handling of these agricultural residues will not only improve the fertility of the soil, it will also decrease erosion and water pollution while conserving soil moisture. A 1974 USDA study estimated that 914 million pounds of manure and 100 million pounds of nitrogen were lost from manure storage and waste handling systems in Montana.(114)

While sewage does not compose a large percentage of total organic residues, it is a rich source of organic matter. One of the prime uses of municipal water is for the transportation of human metabolic residues. Treating wastewater, extracting the sludge and protecting the quality of the nation's water is an expensive and important part of the food system cycle. About one-fourth of sewage sludge is spread on the land. The rest is burned or dumped.(115) Alternative processes presently exist that can treat sludge for a lower cost while producing a high quality fertilizer. For example, Eko-kompost, a Missoula company operated by resource economist Dr. Joseph Horvath, combines the sludge solution from the Missoula water treatment plant with other organic residues, composts the mixture and then markets the finished product in twelve states. While one-fourth of sewage sludge may be presently spread on the land, processing into compost produces a safer, more reliable product. If composting was an integral part of municipal sewage treatment plants, Dr. Horvath estimates that 40 percent could be saved in the construction and operation costs of Montana sewage plants each year.(116)

Another important organic residue is garbage. A 1974 study estimated that "12 percent of the nation's trucks are engaged in the activity of waste disposal of which a substantial part is related to food."(117) The USDA estimates that "In 1977, about 145 million tons of municipal organic refuse were produced." Very little of this is recycled, about one percent.(118) While there might be problems composting these residues, it has been suggested to burn them for energy generation.

It is a strange process whereby edible food becomes garbage in the first place. Food left behind on the plate of a satisfied diner is usually deemed garbage and discarded. Not only is all the energy and labor that went into producing, processing and distributing the food wasted, additional energy and labor have to be expended in disposing of the residue. One strategy for utilizing this resource is to process the table wastes from large cafeterias into animal feed. It is estimated that such reprocessing would "recapture over 9 billion pounds of food wastes annually (from 150,000 of 500,000 food installations in the U.S.).(119)

Further study of the many varieties of organic refuse specific to Montana could identify ways to implement more complete recycling of food system residues while lowering treatment costs.

11.0 THE GOVERNMENT SYSTEM

Our food system could not exist in its present form without the involvement of government. The operation of every part of the food system is entwined in some way with some level of government. It is not possible to analyze and understand the food system without acknowledging the extent of this involvement which is one of the major roles of governments. The major instruments for effecting this involvement are regulation, inspection, licensing, taxation, direct and indirect control and direct and indirect expenditure. The intensive involvement of government in the food system is at least a tacit acknowledgement that without such supervision the free market food system would not provide the reliability and stability that a society must demand of its food system.

The goal of this part of the report is to broadly outline some of the government's more important roles in the food system.

First, Dave Lewis, Director of Office of Budget and Program Planning for Montana, stated that a "rough guess of the dollars spent by the state on support of the Food Production and Distribution System" would be $237.2 million in 1981 out of a budget of $1.4 billion.(120) The major recipients of these funds were the Departments of Highways, Agriculture, Livestock and Health plus Montana State University and the school lunch program.

A surprising number of meals consumed in Montana each day result from some form of government involvement:

The food stamp program disbursed $18.3 million in 1980 to 46,000 Montana recipients.(121) Nationwide, about three percent of grocery sales are food stamp purchases.(122)

During the 1980-81 school year, the Montana school lunch program served over 15 million meals to 110,000 students. The cost to the students for these hot meals was about 50 - 60 cents while the average cost of preparing the lunches was $1.09 per meal. A comparable meal purchased in a restaurant would have cost $1.25 - $3.50. The difference between the actual cost of each meal and its price was covered by Federal, State and local funds. The majority of the lunch subsidy came from the Federal government which contributed $6.7 million to the Montana school lunch program.(123)

The WIC program (Special Supplemental Food Program for Women, Infants and Children), enacted by Congress in 1972, has been one of the most successful government food programs. It provides nutritional and medical assistance to pregnant, nursing or postpartum women and to their infants and children. The WIC program has definitely reduced the number of underweight babies born to low-income mothers who would have, previous to the program, suffered medical and nutritional problems that would have affected the unborn child: low birth weight is the chief cause of infant death. In addition, low birth weight has been linked with blindness, deafness and mental and physical retardation.(124) Newsweek columnist George F. Will recently cited a study that "found that every dollar spent on WIC prenatal services saves $3" in future health costs.(125)

The Montana WIC program spent $3.7 million between July 1, 1980 and June 30, 1981 providing food to 22,000 different people. Also during the same period, a parallel program, Child Care Food Program, spent $1.7 million helping feed 2.7 million meals to over 8,000 children in 25 Montana counties.(126)

One measure of the extent of the involvement of the Federal government in the food system can be obtained by examining a list of the principal Federal agencies with major food interests:

1. Commodity Futures Trading Commission
2. Department of Agriculture
3. Department of Commerce
4. Department of Health and Human Services
5. Department of Interior
6. Department of State
7. Department of Labor
8. Department of Transportation
9. Treasury Department
10. Environmental Protection Agency
11. Export-Import Bank of U.S.
12. Farm Credit Administration
13. Federal Reserve (127)

Another measure of government involvement is that government payments to farmers have often meant the difference between profit and loss. Between 1975 and 1980 Montana farmers received $311 million in government payments. In four of those seven years the cash receipts of Montana agriculture would have been insufficient to cover production expenses without the government payments.(128) A 1974 study reported that "...direct government subsidies have accounted for 30 to 40 percent of the farm income and 15 to 30 percent of the National Income attributable to agriculture since 1955."(129)

Unfortunately, all the myriad government programs which are food related are not part of an overall food system strategy. Many programs result from a response to the desires of special interest groups or from a reaction to an emergency instead of being part of an integrated, coherent food system policy. A recent study by the General Accounting Office stated, "World turbulence...has led to new questions about U.S. agriculture's ability to maintain adequate food supplies in domestic and world markets in the future. In the past, little more has been done than reacting to crises. For the 1980's, however, policymakers must face the challenge of anticipating future circumstances and problems confronting the food and agriculture system and begin to plan for actions appropriate to the times."(130)

Long-range planning for the food system must become a role of governments. No other social structure has the scope, authority or power to construct and carry out a coherent, integrated plan for the food system. And the food system is too important a part of everyone's lives to just be left to chance.

12.0 SURPLUS, SHORTAGE OR UNCERTAINTY?

What will be the future of Montana's - and the nation's - food system? Will food continue to be abundantly available at a reasonable cost? Or will there be severe shortages and drastically higher prices?

The answer is uncertain.

Certainly the present food system has produced an abundant supply of food in the past and in the present. If that trend was extrapolated into the future, the answer to the previous questions would be "Yes, there will be abundant food at reasonable price." Other trends though - extrapolated into the future - such as problems of soil erosion, farm land development, ground water depletion, increased energy and transportation costs, etc. point to future shortages, high prices and food system instability.

The answer to the above questions is uncertain because we really do not know what changes will occur and to what extent. Nor do we know how well our society will anticipate and prepare for food system uncertainty and change. Predicting the future from the past or the present is an uncertain enterprise. Who in 1900 would have predicted either the technological advances of the twentieth century or their irrational use in the mass destruction of people and the environment?

The only certainty is that change will occur and even if its nature and extent can not be accurately predicted, change must be anticipated and planned for. Also it is likely, considering recent history and present trends, that change in the near future will continue to be as dramatic and drastic as it has been in the recent past.

For example, the earth's atmosphere is undergoing an important transformation with the continual release into it of large quantities of carbon dioxide from deforestation and fossil fuel combustion. Certainly this development will have climatic impact, but the nature of that impact is uncertain. Some researchers predict that global temperature will rise altering precipitation patterns, producing drought in important agricultural areas while melting artic ice and raising sea levels. Other researchers discount this notion, predicting instead that plant life will flourish in the elevated levels of carbon dioxide.(131)

Such drastic disagreement between experts complicates the planning process. Similar disputes are common throughout the studies of different aspect of the food system. Dissension of this sort rather than demonstrating the futility of planning indicates the necessity of preparing for several possible futures; it is not sufficient to merely assume in the face of uncertainty that the food system will just take care of itself.

While uncertainty about the future can not be eliminated, individually and collectively we can all prepare for it more effectively.

13.0 AGENDA FOR THE FUTURE

The first thing that must be on any future agenda for Montana's food system is more thorough research, analysis and diagnosis of the system's strengths and weaknesses.

Perhaps the most significant discovery of the present study was the lack of comprehensive research on Montana's complex food system. While some parts of the food system, such as agriculture, do receive careful attention, other parts of the system are totally neglected. Even the available information on agriculture is not usually related to the entire system. Any effective strategy for creating a more stable, sustainable food system must be based on a thorough understanding of how the food system operates.

Since this study is not the comprehensive analysis required, suggesting ways to improve the food system may seem contradictory in light of the above remarks. Nevertheless, there are some general recommendations which derive from the present study and from other research by the Cornucopia Project.

13.1 Suggestions For Consumers

No other part of the whole food system is so immediately responsive to individual and collective action as the home food system. Through careful selection of the foods they buy, by composting their garbage, by practicing increased energy conservancy and through a number of other innovative actions, consumers can tomorrow start to transform their part of the food system. The following suggestions are just a few of the many actions that could be adopted.

1. If you are concerned about the state of your food system, one of the first, and perhaps the best, things that you can do is to find other people that share your concern. Since the food system is an integrated whole made up of all of us, any individual action can be improved by group action. The essence of a sophisticated food system is cooperation on myriad levels; cooperation in strengthening the system is an appropriate and effective strategy. Most of the suggestions in the section can be adopted either individually or cooperatively.

2. Since effective action comes from knowledge, an important part of improving your part of the food system is to learn more about the food system in general and your part of it in particular. Some of the books used in this study and listed in the bibliography can help broaden your knowledge and many are available in public libraries. Other sources of information include magazines, newspapers and government agencies.

3. Another important part of becoming more active in your food system is to become more aware of what you eat and where it comes from. A shift from highly-processed food to fresh and/or local foods can improve both the food system and your health. A greater awareness of good nutrition and adopting healthy eating habits will result in lower food bills (since fresh foods are usually cheaper than processed foods as well as being more nutritious) and will improve the food system by reducing the purchase of highly processed foods.

4. Form a local Cornucopia Project consisting of people who want to work at changing some aspect of their food system. Possible activities include establishing home and community gardens, bartering, setting up food banks, cooperative food buying, storing and preserving.

5. Starting or expanding a home garden can save money and energy while providing food of incomparable freshness. In addition, many people find the act of gardening compensation itself. Gardeners can recycle their garbage by composting their organic residues rather than having them buried in a land fill. Composting will improve the quality of your soil and preserve valuable organic matter that would otherwise be wasted.

6. If you garden or plan to garden, seek out your County Extension agent for help and information. Other valuable sources of information include books on gardening many of which can be found in a library, and the practical experience of local gardeners and farmers.

7. Since your home food system accounts for at least 25 percent of your residential energy consumption, it is a good place to implement energy conservation. Study your kitchen to identify appliances that are high energy users and ways to decrease that usage. Try to plan your food purchases so that extra trips for one or two items can be avoided.

8. Purchase locally-grown fruits and vegetables in season, taking advantage of their peak nutritional value and decreased cost. Buying locally-grown food strengthens the local food system and the local economy. You can also process these foods yourself and store them for the cold weather months.

9. Become aware of changes in agricultural land usage in your area and support the appropriate use of prime agricultural lands for farming or community gardens.

10. Create a personal emergency supply of food. Temporary food shortages may result from many causes: national truckers' strike, oil embargo, severe weather, agricultural infestations or crop failures, geological events such as earthquakes and volcanoes. A one month food supply of basic foods can help you endure temporary food shortages and sudden price increases more easily.

13.2 Suggestions For Local Governments

1. Local governments should not leave all the decisions about the local food system in the hands of others. The first step to greater local control is to thoroughly study the unique characteristics of the local food system. The Missoula Planning Office performed such a study for the city and county of Missoula. Their report, Missoula County Agricultural Protection Study, represents an initial step

toward local understanding and control of the local food system.

2. Local governments can aid and encourage local food production and distribution by instituting a department to regulate and protect agricultural land use (to the extent that state law permits), encourage urban and rural food production, develop urban markets for local produce, initiate educational programs and create plans to meet normal and emergency local food needs through local production and storage.

3. Identify the long- and short-term costs before converting prime farmland to non-agricultural uses.

4. Establish community gardens particularly for low income residents. Seeds, tools and technical assistance on gardening could be made available to recipients of food stamps and other kinds of food assistance.

5. Aid the establishment of gardens and/or greenhouses in schools, hospitals and nursing homes.

6. Promote loan funds for food self-reliance projects, such as greenhouses and food preservation and storage operations.

7. Require garden areas in new multiple unit housing projects.

8. Incorporate composting operations in wastewater treatment plants.

9. Establish farmers' markets if they do not already exist or promote existing ones.

10. Encourage the establishment of local food banks to store and distribute surplus food.

11. Promote the purchase of food supplies by local institutions from local growers.

12. Develop emergency planning to cope with a food crisis where normal food supplies might be disrupted for one to four weeks or even longer.

13.3 Suggestions For State Government

1. Again, the first suggested action is that state government thoroughly study the state food system in a comprehensive manner, identifying the system's unique characteristics, its strengths and its weaknesses.

2. Promote greater crop diversification by offering incentives to farmers to diversify production, utilizing technical assistance from extension agents and low-interest state-guaranteed loans to make changes necessary for diversification.
3. Fund research by Montana State University into the potential of producing various crops needed in the state.
4. Establish demonstration experiments to test crop, animal and fish varieties suitable to our soil and climate as well as developing low-input sustainable farming techniques.
5. Monitor changes in agricultural lands more closely through additional funding to the Department of Agriculture and the Crop and Livestock Reporting Service.
6. Enforce and develop laws to discourage erosion. Link state assistance programs to avoidance of excessive soil erosion.
7. Promote the purchase of state agricultural products by state institutions.
8. Help establish more farmers' markets and aid the organizing of wholesale farmers' markets to supply retailers, consumer co-ops, and other volume purchasers.
9. Prepare a state-wide inventory of the types and amounts of organic wastes available now and in the future and assess the ability of these wastes to improve soil fertility and tilth and their potential energy use.
10. The state should plan appropriate actions for a variety of food emergencies.
11. Finally, the state should develop long-range food system plans which would emphasize increasing local self-reliance and economic viability while decreasing the vulnerability of the food system. In order to develop and implement such plans, the state should sponsor an annual study of the foods consumed in Montana: what kinds, what amounts, where they come from and how they are changing.

14.0 APPENDIX: FOOD CONSUMPTION IN MONTANA

One of the goals of this study was to compile an inventory of the different foods produced, imported and consumed in the state. Such information is necessary in order to have a clear understanding of Montana's food system and in order to answer some important food system questions: How much of the food consumed in the state is imported? What impact does this have on the transportation system? Are there foods presently being imported that could instead be produced in the state, eliminating long-distance transportation and bolstering local economies? How much would the state's food system be disrupted by a disruption of the national transportation system or of production in other states?

These are just a few of the important questions concerning the food system that a food consumption inventory could help answer. Unfortunately, such an inventory has not been done in the past, and this study was unable to produce a comprehensive inventory.

One problem that makes a state food inventory difficult is that nobody knows how much of each type of food is consumed in the state. While there are national per capita consumption figures for a wide variety of foods, there is good reason to believe that Montana consumption patterns often deviate from the national average. For example, this study found that with fresh fruits and vegetables the importation into the state was usually less than predicted consumption.

Table 1 lists pounds of production, consumption and importation of fresh fruits and vegetables for 1980. The consumption figures were computed by multiplying national per capita consumption for each food by Montana's population in 1980. The importation figures are computed from figures gathered by the Plant Industry Division of the Montana Department of Agriculture which compiles a monthly "Summary of Fruits and Vegetables Inspected and Used in Montana Markets..." These figures come from licensed produce wholesalers. The statistics are broken down into two categories: imported and homegrown.

Table 2 shows Montana's production and consumption of meat, poultry and fish. These statistics should be read with a certain amount of caution. At first glance it seems that Montana ranchers produce cattle with a retail weight seven times greater than state consumption of beef. But most Montana beef is not processed in state.

Table 3, Montana Production and Consumption of Dairy Products, would seem to indicate that Montana was importing milk to meet consumption requirements. But milk is also exported. In 1980, fifteen million pounds of Grade "A" milk were imported into the state while 35 million pounds were exported.

Table 4 shows the production and consumption of grains and legumes in Montana. Although it would appear that Montana farmers are raising far more corn, barley, oats and wheat than are being consumed in-state, again figures are somewhat misleading. It is not known how much of Montana's grain production is being fed to livestock, or how much grain is shipped out-of-state for processing and imported into Montana in the form of flours, cereals and baked goods. Therefore, the production figures can give only an indication of Montana's capability to produce grains for in-state consumption.

One of the purposes of a food inventory is to compute how much food is imported into the state. Because much of the information needed for this calculation is not available, only a rough estimate can be made.

Montana produces approximately twenty commodities for which production statistics are collected. Beef, lamb, creamed and cottage cheeses, sweet cherries, barley, corn, oats, dry beans, sugar beets and honey are raised in sufficient quantities to be exported. In these eleven commodities then, Montana has the capability to be self-sufficient.

But Montanans consume a wide variety of fresh, frozen, and canned fruits, vegetables and dairy products that are not produced in Montana, or are produced in such small quantities that no records are kept. Based on the statistics that are available, it would seem that about 60 percent of the food consumed in Montana is imported. This estimate may be low, since some of the commodities Montana produces are sent outside the state for processing.

Another purpose of a food inventory is to demonstrate the potential markets for increased production of a wider range of agricultural products within the state. It is difficult to predict how much more of the foods consumed in Montana could be produced in the state. Certainly Montana has abundant agricultural land. But a diversified production would require irrigation. Yet the opportunity exists particularly for increased state production of fresh fruits and vegetables.

Table 1:

	Production		Consumption		Importation	
	weight 1000lb	value $1000	weight 1000lb	value $1000	weight 1000lb	value $1000
Vegetables						
Artichokes	nc		236.10	286.72	105.04	127.10
Aspargus	nc		236.10		141.78	
Broccoli	nc		1337.90	923.15	891.45	615.10
Cabbage	45.35	12.70	6610.80	1851.02	3173.50	888.60
Carrots	3.55	1.14	4800.70	1536.22	2375.50	760.20
Cauliflower	0.97	0.84	1023.10	890.10	997.00	867.39
Celery	nc		5745.10	1322.16	6115.68	2079.00
Cucumbers	3.16	1.33	3148.00	1070.32	1746.40	733.50
Eggplant	nc		393.50	306.93	154.90	120.80
Green peppers	nc		2597.10	1895.88	1661.50	1212.90
Lettuce	4.60		19596.30	6858.70	14821.30	5187.50
Mushrooms	nc		9286.60	16808.75	629.00	1138.50
Onions	nc		8027.40	2087.12	5999.60	1559.90
Potatoes	10266.60	2361.30	38799.10	8923.79	25979.90	5975.40
Snap bean	3.44	2.48	1023.10	736.63	161.90	116.60
Squash	48.10	22.60	nc		2490.30	1170.40
Sweet Corn	nc		5194.20	1766.03		
Sweet potatoes	nc		2675.80	1632.23	654.04	399.00
Tomatoes			8971.80	5293.36	7430.70	4384.10
Fresh Fruits						
Apples	638.32	389.40	12592.00	7681.12	9980.00	6087.00
Bananas			16369.60	5401.97		
Cherries	1400.00	1204.00	472.20	407.04	344.30	296.80
Grapefruit			6138.60	886.41	3333.70	1267.00
Lemon/lime			1810.10	1013.67	1085.70	607.60
Oranges/tangerines			13929.90	5850.56	10623.20	4461.70
Grapes			2833.20	2634.88	2930.70	2725.50
Melons			13300.30	5719.13	2885.60	1212.00
Peaches/nectarines			5509.00	3140.13	785.40	447.70
Pears			1888.80	406.65	1200.30	522.10
Plums			1180.50	1027.04	722.30	626.40
Vegetables, Processed						
Asparagus, frozen			47.22	161.02		
Asparagus, canned			236.10	462.76		
Beets, canned			944.40	387.20		
Broccoli, frozen			1101.80	1189.94		
Brussel sprouts, frozen			196.75	192.82		
Carrots, frozen			731.91	468.42		
Carrots, canned			393.50	184.94		
Cauliflower, frozen			362.02	148.43		
Corn, frozen			1518.91	1139.18		
Corn, canned			4564.60	2008.42		
Lima beans, frozen			369.89			
Lima beans, canned			236.10			
Onions, dehydrated			2046.20			
Onions, frozen			535.16			
Peas, frozen			1211.98	787.79		
Peas, canned			2597.10	1142.72		
Pickles, canned			5430.30	2497.94		
Potatoes, frozen			17864.90			
Potatoes, canned			1023.10	491.09		
Pumpkin and squash, canned			314.80	229.80		
Saurkraut			944.40	377.76		
Snap beans, frozen			787.00	550.90		
Snap beans, canned			4879.40	2488.49		
Spinach, frozen			590.25	330.54		
Spinach, canned			393.50	181.01		
Sweet potatoes			787.00	432.85		
Tomatoes, canned whole			4800.70	1920.28		
Tomatoes, pulp and puree			629.60	151.10		
Catsup, paste, sauce, canned			9522.70	4316.96		
Tomato and vegetable juice			2518.40	629.60		
Other, canned			708.30			
Fruits, Processed						
Fruits, frozen			2179.99			
Citrus juices, frozen			7791.30	9474.22		
Fruits, canned and chilled			13693.80	5944.94		
Fruit juice, canned			18203.31			
Fruits, dried			2313.78	3100.46		

NC - Not Collected

Table 2

Montana Production and Consumption of Meats, Poultry Products, and Fish

Commodity	1980 Production (1,000 lbs.)	1980 Consumption (1,000 lbs.)
Meats		
Beef	434,978.88	60,205.50
veal	NC	1,180.50
Lamb & Mutton	12,756.30	1,023.10
Pork	49,858.25	53,752.10
Poultry		
Chicken	1,051.00	39,350.00
Turkey	NC	8,263.50
Eggs	2,219.44	14,704.31
Fish	242.16	24,937.25

Table 3:

Montana Production and Consumption of Dairy Products

Commodity	1980 Production (1,000 lbs.)	1980 Consumption (1,000 lbs.)
Butter	1,938.00	3,462.80
Cheese		
Hard	8,762.53	13,851.20
Cottage & Creamed	5,200.00	3,541.50
Evaporated & Condensed Milk	NC	5,902.50
Fluid Milk & Cream	193,198.79	196,750.00
Frozen Dairy Products	13,986.00	20,698.10
Dry Milk Products	NC	5,351.60

Table 4:

Montana Production and Consumption of Grains and Legumes

Commodity	1980 Production (1,000 lbs.)	1980 Consumption (1,000 lbs.)
Barley	2,116,800.00	1,333.97
Corn	33,152.00	17,391.02
Oats	70,670.42	4,220.68
Rye	NC	482.04
Wheat	6,396,000.00	129,690.31
Dry edible beans	17,600.00	2,881.05
Dry field peas	NC	121.89

15.0 FOOTNOTES

1. The Cornucopia Project is sponsoring studies similar to this one of every state in the U.S. A study of the nation's food system, *Empty Breadbasket*, has been completed and is available.

2. U.S. Department of Commerce, *Statistical Abstract of the United States 1981*, (Washington, D.C.: Government Printing Office 1982), p. 424. About $302.9 billion was expended on food in 1980, or $1,330 per capita.
$1,330 x 787,000 = $1.0467 billion

3. U.S. Department of Agriculture, *Leading Indicators of the Farm Sector,* (Washington, D.C. 1980), p.159.

4. Montana Department of Agriculture, *Montana Agricultural Statistics 1982*, (Helena, MT: 1982), p. 6.

5. Compiled from data provided by Research and Information Systems Division, Montana Department of Administration. These figures are minimum figures. Many workers who are part of the food system as defined in this report are not included in these figures due to the nature of the statistics.

6. U.S. Department of Energy, *Agriculture and Food Processes Branch Program Summary Document*, (Washington, D.C. 1980), p. 1.

7. General Accounting Office, *Food, Agriculture and Nutrition Issues for Planning*, (Gaithersburg, MD, 1982), p. 10.

8. *Montana Agricultural Statistics 1982*, pp. 17, 6

9. IBID, p. 8

10. K. Ross Toole, *The Rape of the Great Plains*, (Boston, 1976), p. 23.

11. Merrill G. Burlingame, *The Montana Frontier*, (Helena, MT: State Publishing Co., 1942), p. 284.

12. K. Ross Toole, *Twentieth Century Montana*, (Norman, OK: University of Oklahoma Press, 1972), p. 26.

13. Cornucopia Project, *Empty Breadbasket? The Coming Challenge to America's Food Supply and What We Can Do About It*, (Emmaus, PA: Rodale Press, 1981), p. 34.

14. How much land is in farms and ranches? Page 8 of *Montana Agricultural Statistics 1982* states that land in farms and ranches in 1981 equaled 62,600,000 acres. Then on the next page, all land in farms in 1981 is listed as 62,100,000

acres. Apparently there is grazing land that is included in the first figure but not in the second.

15. U.S. Department of Commerce, Bureau of the Census, 1978 Census of Agriculture Part 26, Montana, (Washington, D.C.: GPO 1981), p. vii.

16. Montana Agricultural Statistics 1982, p. 9.

17. Phone converstations on 8-27-82 and 8-25-82 with Gordon Watson, Montana coordinator of National Resources Inventory.

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75. Richard Stroup and Thomas Miller, Feasibility of Ethanol from Grain in Montana, (Bozeman, MT: 1978), p. 1

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93. $1,330 per capita x 787,000 = $1.0467 billion.

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95. "49th Annual Report of the Grocery Industry", Progressive Grocer, vol. 61, no. 4, April 1982, p. 51

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99. Robert Emerson, Fast Food, (New York, Lebhar-Friedman Books: 1979), Table 2-1, p. 12

100. IBID, pp. 5, 47

101. U.S. Department of Commerce, Statistical Abstract of the United States 1981, (Washington, D.C.: Government Printing Office 1982), p. 819

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103. Norman Myers, "The Hamburger Connection: How Central America's Forests Become North America's Hamburgers", Ambio, vol. 10, no. 1

104. Statistical Abstract of the United States 1981, pp. 751, 753. Residential construction in Montana was worth $205 million in 1980 ($205 million x .10 = $20.5 million). Residential construction in the United States was $87,261 million in 1980 ($87,261 million x .10 = $8,726 million). A figure of 10 percent of housing costs being related to the food system was suggested by Steinhart and Steinhart, p. 309.

105. The retail value of major kitchen appliances shipped in 1980 was $8.102 billion (Statistical Abstract of the United States, 1981) or $35.69 per capita. $35 x 787,000 = $28 million.

106. The retail value of small electric kitchen appliances shipped in 1980 was $1.874 billion or $8.25 per capita.

107. The food system consumes at least 17 percent of all energy used in the United States, and the home food system uses 27 percent of food system energy or 4.59 percent of total energy use. (1979 Handbook of Agricultural Charts, p. 34) "The 75 million households in the U.S. consume more than one-fifth of the nation's total energy.." [Eric Hine, Richard Goeltz and Janet Carney, Residential Energy Use and Conservation Activities...., (Oak Ridge, TN: 1981), p. 1] So .05/.20 = .25.

108. Lynda Steele, Historical Energy Statistics, (Helena, MT: 1980)

109. Montana had 284,000 households in 1980 (Statistical Abstract of the United States 1981, p. 44). Twenty-nine percent of households in the West had gardens in 1980 (The Gallup Organization, National Gardening Survey 1980-81, [Burlington, VT: Gardens for All, 1980], p. 11). The average yield per garden was 588 pounds of produce worth $441 (p. 29). The average expenditure per gardener was $50 (p. 63), and the average garden size was 663 square feet (p. 11).

1. 284,000 households x .29 = 82,360 gardens
2. 588 pounds/garden x 82,360 gardens = 48.428 million pounds
3. $441/garden x 82,360 gardens = $36.32 million
4. $50 expenditure/garden x 82,360 gardens = $4.118 million
5. 663 square feet/garden x 82,360 gardens = 54.605 million sq.ft.
6. 54,605,000 sq.ft./43,560 sq.ft. per acre = 1254 acres

110. About 26 percent of food expenditures are for meals consumed away from home. (U.S. Department of Agriculture, _Food Consumption, Prices and Expenditure 1960-80_, p. 98, Table 87) $1 billion x .74 = $740 million

111.

1. $ 20 million on kitchen construction
2. $ 33 million on appliances
3. $ 37 million for residential energy
4. $ 4 million for garden supplies
5. $740 million for food
6. $834 million total home food system expenditures

112. _1980 Appraisal, Part I_, p. 268

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114. Donald L. Van Dyne and Conrad B. Gilbertson, _Estimating U.S. Livestock and Poultry Manure and Nutrient Production_, (1978), p. 9

115. _1980 Appraisal, Part II_, p. 182

116. Phone conversation with Dr. Joseph Horvath of Eko-kompost

117. Steinhart and Steinhart, p. 308

118. _1980 Appraisal, PartII_, p. 182.

119. _Agriculture and Food Processes Branch Program Summary Document_, p. 56

120. Personal communication, September 8, 1982, from Dave Lewis, Director Ofice of Budget and Program Planning

121. *Statistical Abstract of the United States 1981*, p. 129

122. *49th Annual Report of the Grocery Industry*, p. 116

123. Phone conversation with Bris Skiles, Office of Public Instruction, August 13, 1982.

124. Mary Painter, "Poor Children: The Big Losers Under Reagonomics", *Food Monitor*, July/August 1982, pp. 23, 24

125. George F. Will, "The South Carolina Hybrid", *Newsweek*, December 20, 1982, p. 92

126. Personal communication on September 17, 1982 from Mary Ellen Holberson, Nutrition Coordinator Health Services Division of Health and Environmental Sciences.

127. *Food, Agriculture and Nutrition Issues for Planning*, p. 58

128. *Montana Agricultural Statistics 1982*, p. 10

129. Steinhart and Steinhart, p. 311

130. *Food, Agriculture and Nutrition Issues for Planning*

131. Two recent articles representing the two sides of the debate are: Roger Revelle, "Carbon Dioxide and World Climate", *Scientific American*, vol.247, no.2, August 1982 Sylvan H. Wittwer, "Carbon Dioxide and Crop Productivity", *New Scientist*, vol.95, no.1315, July 22, 1982

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Montana Food System Organizations

There are many organizations which directly or indirectly are working toward developing a sustainable food system in Montana. The following is a selected list of organizations working with consumers, farmers, and the food industry in Montana.

Montana Farm Bureau
1505 S. Wilson Ave.
Bozeman, MT 59715

Big Sky Farmers and Ranchers
Marketing Cooperative
1127 Smelter Ave.
Black Eagle, MT 59414
(406) 452-2083

Montana Department of Agriculture
1300 Cedar
Helena, MT 59601
(406) 449-3144

Bear Paw Farmers and Ranchers
Marketing Cooperative
1108 15th Ave. S.W.
Great Falls, MT 59401
(406) 453-9625

Montana Farmers' Union
750 Sixth Aven. S.W.
Great Fall, MT 59401
(406) 452-6406

Farmers Home Administration
4930 Ninth Ave. South
Great Falls, MT 59405
(406) 454-3446

The Montana Land Reliance
P.O. Box 355
Helena, MT 59601

Norhern Plains Resource Council
419 Stapleton Building
Billings, MT 59101
(406) 248-1154

Western SUN
J. Lee Cook
Energy Division, DNRC
32 S. Ewing
Helena, MT 59601
(406) 449-4624

Heron Food & Garden Co-op
General Delivery
Heron 59844
Judy Hutchins
In operation since: 1976

Prickly Pear, Inc.
P.O. Box 422
Helena 59601
Judith Johnston
In operation since: Aug. 1979

The Flathead Valley Food &
Garden Cooperative, Inc.
P.O. Box 1497
Kalispell 59901
Mary Miller
In operation since: March 1979

Malta Co-op
P.O. Box 322
Malta 59538
Sioux Surbrugg
In operation since: Dec. 1979

Lower Flathead Co-op
P.O. Box 297
St. Ignatius 59865
Viki Albright, John Walker,
David Munson-Young
In operation since: Jan: 1979

Sapphire Mountain Co-op
Route 3, Box 1312
Stevensville 59870
Peter & Jean Lethenstrom
In operation since: 1975

Swamp Creek Community Grits
P.O. Box 414
Thompson Falls 59873
Coordinatorship rotates monthly
In operation since: Aug. 1978

Copper City Food Co-op
730 W. Broadway
Butte 59701
Dick Ward
In operation since: 1978

The New Frontier Food Co-op
124 N. 18
Billings 59101
Sandra Bennett
In operation: 2½ years

Crossroads Food Center
325 S. Wallace
Bozeman 59715
Manager and 7 member board
In operation since: May 1979

Bitterroot Food Co-op
Tin Cup Road
Darby 59829
Mary Frechette
In operation since: 1974

Tobacco Valley Co-op
P.O. Box 857
Eureka 59917
Sue Llewellyn
In operation since: 1977

Our Treasures State Food Co-op
Opportunities, Inc.
607 11 N.
Great Falls 59403
Bill Magee
In opeation since: 1979